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CIVIL ENGINEERING.

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Steam and its Condensation. By THOMAS PROSSER, C. E.

CHAPTER II.

Introductory and General Observations.

One chapter* has already appeared on this subject, but in consequence of the Hon. Isaac Toucey, Secretary of the U. S. Navy having appointed a Board of Engineers to examine into the invention described in Vol. xxxvi, (3d Series,) p. 88 of this *Journal*, and exemplified by a colored Plate constituting Chapter I; a few more chapters are purposed with the view of further elucidating the subject, and more fully sustaining the theory on which that invention rests.

I am as much indebted to Sir John Leslie† for remarking, that, "near the freezing point, water is scarcely a better conductor of heat than ice, but as it approaches ebullition it gains such an increase of *mobility* as to conduct heat *five* times faster than in its torpid state," as Mr. Watt was to Dr. Black‡ when he was informed by him of the existence of latent heat. Mr. Watt wrote,§ "when once the idea of the separate condenser was stated all these improvements followed as corollaries, in quick succession." I would write, when once the idea of getting rid of the air-pump was started, all these improvements followed as corollaries in quick succession; but the coincidence is rather Hibernianish, I admit.

* Journal of the Franklin Institute, Vol. xxxvi, (3d Series,) page 88.
† Leslie's Observations, &c., on Heat and Moisture, page 17.
‡ Farey on the Steam Engine, page 312. § Ibid. page 314.

I wish to show the propriety of adopting some method of examination which will give actual, practical, and not mere theoretical results, for comparison between the *effective* working of my surface condenser and any other.

This cannot be done by the application of the indicator and thermometer, for the former gives no account of its own friction, of the steam condensed in the cylinder, nor of the water which enters it in a vesicular state. The thermometer gives the temperature of the feed water, it is true, but not the quantity. They are only valuable in a comparison of two engines of the same class, but are entirely useless in comparing my method of applying and condensing steam with any other. The indicator is an excellent instrument, but not a perfect one, and is unfortunately, just now, overrated in proportion to the neglect and indifference with which it has been regarded, until very recently, although it was invented about seventy-four years ago. The consequence is, that the usual calculations of the power of steam engines is fallacious in the extreme, and *made up* of mere conceits, mostly on the authority of Tredgold, who, although a thorough practical man himself, has reduced the friction of every particle of moving matter connected with the steam engine, to a mere impracticable theory, for the difference in workmanship alone may double or treble most of the calculations, and yet not be perceptible to the most skilful engineer, without a thorough and careful examination.

Nevertheless, the steam engine itself is the veriest embodiment of a *theory* of the laws of nature as understood in the operations of vaporization, condensation, and conduction of heat. These laws must govern its actions, and every real improvement must have for its object, conformation to them, and not mere subterfuges to avoid the consequences of their violation.

Practical experience had nothing to do with the invention of the low pressure condensing steam engine as we now find it, for, the air-pump, the separate condenser, the double action, were all the mere dreams of a civil engineer who never had any experience as a *practical engineer*, as the term is now commonly understood, and yet, James Watt was a most thoroughly practical and philosophical engineer, for he put into practice that which his philosophy had conceived. Had he died when he first became acquainted with Dr. Roebuck, his invention would have been set down as the dream of a philosopher.

It will be seen that in this view of the case the natural order is just reversed, and the physical power of steam, which rests upon a theory, is measured practically,* while the power of the steam engine itself, which is altogether a practical machine, is measured theoretically.

Complicated mechanism, too often passes for skilful arrangement, and I cannot but think, notwithstanding the high estimation in which I hold the inventive genius of Mr. Watt, that the introduction of the air-pump has been fraught with immense loss to the whole world.

Mr. Watt, himself, never obtained more than 60 per cent. of the power of the full steam. For one pound of steam at 12·572 lbs. per square inch, has a mechanical power equal to raising 56,778 lbs. 1 foot,

* By the Indicator, whether the steam is high or low pressure, and however rapidly the piston reciprocates.

and deducting from that (= 2·095 lbs. per square inch for back pressure) 9463 lbs. raised one foot high, we have 47·315 to be divided by 33,000, which gives 1·434 H. P. from one pound of such steam, or 1 H. P. from ·7 lbs., but Mr. Watt obtained in effective work done but 1 H. P. from 1·156 lbs.* It is even said that he calculated to evaporate 1·7 lbs.† of water per minute per H. P., and if so, the coal consumed to evaporate it being ·1344 lbs., must have evaporated at the rate of 12·649 lbs. of water to 1 of coal, while the *calculation* is that 1 lb. of coal evaporated but 8·62 lbs.‡ of water, and 8·064 lbs. of coal per hour gave 1 H. P.; but we are far from being certain that the bushel of coal weighed no more than the 84 lbs., which it was taken at, for there has always been a looseness as to that matter, and which continues to the present day according to a recent writer in the *Journal of the Franklin Institute.* But this was an extraordinary performance and far exceeded any average, for the H. P. was nearly equal to the grinding of one bushel (60 lbs.,) of wheat per hour, with 8·064 lbs. of coal, a feat which *no* engine of the present day can equal, and yet we hear of inventions which enable steam engines to perform work equal to 1 H. P., with a consumption of two or three pounds of coal per hour, *made up* of indicator diagrams, cut-offs, governors, and steam gauges.

The indicator merely gives the data for obtaining the power developed, but it gives none for obtaining the effective power applied to a useful purpose. It tells nothing of the condensed steam and vesicular water which passes uselessly, and which is by many supposed to exceed the useful steam which enters the cylinder. That the condensation of steam in the cylinder is enormous, is proved by the fact, that although air is a very bad conductor of heat, yet no expense is thought too great to protect the outside of the cylinder from it, in cases where it tells upon the work done, and that work can readily be measured as in pumping engines. And yet, that is nothing compared with the condensation going on inside the cylinder, which is as the product of the difference of temperature between the boiler and condenser, multiplied by the area exposed to it in the cylinders. Externally, then, the exposure of the heated cylinder, is to ordinarily dry air which absorbs the heat very slowly; internally, it is conveyed with immense velocity by the steam to a surface of iron, which absorbs it *instantaneously* so long as there is any difference of temperature between them.

In the three condensers which I shall investigate, I have assigned values which I believe will always be found reasonable; for instance, I have assigned to Hall's system of condensation 18 per cent., to Pirsson's 10 per cent., and to my own 2 per cent. of steam condensed in the cylinders, which I believe is far below the truth in the two first cases. These are rough calculations, but are sufficiently accurate for the present purpose. I have selected Hall's and Pirsson's surface condensers to compare with my own, because they have both attained a position which no others have. Hall's condenser was a noble invention, but the air-pump killed it, while Pirsson's still exists in public

* Farey on the Steam Engine, page 515. † Ibid. page 577. ‡ Ibid. note on page 516.

favor most unaccountably, for although in many respects superior to Hall's, principally on account of using less cold water, yet its inability to supply itself with distilled water to make up for the waste, must cause it to follow its illustrious predecessor, as too imperfect and too complicated a machine for the present day. Any condenser which does not make ample provision for recuperating the boiler waste water in the simplest, most certain and efficient manner, is a failure.

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CHAPTER III.

Tabulated facts or data, giving the main features of the theories of Hall's, Pirsson's, and Prosser's systems of condensation, with their effects upon the vaporization, condensation, and absorption of heat.

TABLE I.

	HALL.			PIRSSON.			PROSSER.		
	°C	Avg.	Diff.	°C	Avg	Diff.	°C	Avg	Diff.
Temperature of steam in the boiler, say,	110	66		140	95		198	150	
Temperature of feed water entering boiler,	22			50			102		
Coefficient of absorption—see Table II.,		364			480			700	
Temperature of steam entering the cylinder,	106	59	94	130	90	80	180	142·5	75
Temperature of steam entering the condenser,	12			50			105		
Condensing water entering,	6	10·5	9	6	28	44	6	53·5	95
Condensing water leaving,	15			50			101		
2 Differences of averages,			48·5			62			89
3 Coefficient of absorption—see Table II.		142			212			314	
Total heat in the steam entering the cylinder,	638·8			646·1			661·4		
4 Total heat in the feed water,	22		616·8	50		596·1	102		559·4

This Table is necessarily arbitrary, but is believed to be sufficiently correct for the purpose intended. The Table following is founded on the experiments of Sir John Leslie, which I have before referred to. I am not strictly justified however, in carrying it beyond the boiling point, nearly up to which I have myself proved the correctness of the theory, but surely I cannot err in carrying it much further than I have done. That theory is, that, *water at the boiling point absorbs heat five times more rapidly than it does at the freezing one.*

TABLE II.

Formula 100· + 4 for each degree Centigrade.	
Coefficient of Absorption.	Temperature.
100	0°C.
142	10·5
212	28·0
314	53·5
364	68·0
480	95·0
500	100·0
700	150·0

This Table has a most important bearing on the subject of absorption of heat by water. It shows, that the higher the temperature of

the water which absorbs the heat, the more rapidly will it perform that office. Of course it does not abrogate that other law, of difference of temperature, without which there can be neither absorption nor condensation.

CHAPTER IV.

On Boilers and Boiler Water.

The importance of absolutely pure water in boilers cannot be too strongly insisted upon, for on that depends, not only the economy of fuel, but the durability of boilers also; for pure water absorbs heat much faster than any other, and has no perceptible effect upon *pure* iron, and therefore the metal allows the heat to pass more rapidly, to an extent which will astonish engineers when steel tubes come into vogue, as they must do sooner or later. The water indeed, in almost any state, is ready enough to absorb the heat, but when it is at all impure, the deposit from it which coats over the whole interior surface of the boiler, and more particularly the hottest parts of it, will not allow it to pass. The best boiler water becomes bad in a few hours from this cause. If water contains but 2 gr. of solid matter per gallon, (and there is no river water so pure as that) and one gallon per minute be evaporated from a boiler containing 100 gallons, the whole will contain 26 grs. per gallon in 20 hours, and that makes very bad boiler water. Blowing through, wastes fuel, but gets rid of the loose deposit, but not of the non-conducting substance which coats over every part of the boiler, nor of those most destructive ones which attack the iron and destroy it in from five to ten years, which, with pure water alone, should last at least twenty or even thirty years.

Graham says,* that the loss produced by a scale of sulphate of lime of not more than one-sixteenth of an inch thick, amounts to 14·7 per cent. He also bears witness to the fact of the great economy of fuel in the evaporation of water "from the increased results obtained with increase of pressure, and apparently due to that condition." We can now see how it is that old boilers never work so well as new ones; new boilers are always paragons (see Bourne on the Steam Engine, p. 64,) of perfection. Now a boiler which never has anything but distilled water in it, is always equal to new, and hence, although I can instantly convert my steam engine from a condensing into a non-condensing one, no fair comparison can be made between the economy of the two methods of working, unless mine is continued long enough to deposit the usual mud and scale on the boiler, so as to bring it to the usual state of a boiler working under ordinary circumstances. I claim that there is a saving of at least 10 per cent. from this cause over any other surface condenser; for, by whatever other means the boiler waste is recuperated, it just amounts to a boiler and distilling apparatus of large proportions, and whether separate, as in Ericsson's, or combined, as in Hall's and Pirsson's condensers, it is too cumbersome and complicated, and has been abandoned, for engineers will not be bothered with the working of them—they may just as reasonably be expected to keep a distillery

* Journ. Franklin Inst. vol. xxxvi, (3d series,) p. 14.

on board to make their own grog—and therefore, they pump the salt water into the boiler to its certain destruction.

From an inspection of the Tables I and II, Chapter III, it will be seen, that to evaporate the same amount of water in the same space of time, will require very different areas of heating surfaces, being inversely as the rate of absorption of heat by the boiler, that rate being in direct proportion to the difference of average temperature of the fire and gaseous products in the furnace, and the average temperature of the water in the boiler, combined with the coefficient of absorption due to the latter. The most important point however, in regard to calculating for the equivalent area of heating surface, is the total heat required to be restored to the feed water after it enters the boiler, that is to say, the difference between the total heat in the feed water entering the boiler, and leaving it as steam, or rather as entering the cylinder.

Omitting all consideration of the heat in the furnace and boiler as being an unnecessary refinement in an inquiry like this, we will assume, that 20 feet area of boiler surface is sufficient for Hall's system of working, we have for Pirsson's $=14{\cdot}657=20\left(\frac{364}{480},\frac{596{\cdot}1}{616{\cdot}8},\right)$ we have for Prosser's $=9{\cdot}432=20\left(\frac{364}{700},\frac{559{\cdot}4}{616{\cdot}8}\right)$, independent of allowance for condensation in the cylinder, and calculated at 18 per cent. for Hall, 10 for Pirsson, and 2 for Prosser, and also independent of 10 per cent. in favor of the latter on account of supplying pure water.

Therefore,	Hall,	Pirsson,	Prosser.
Will respectively require of boiler heating surface,	20·00	14·657	9·432
Add for condensation in the cylinder,			
$\frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}$, . . .	4·39	1·646	0·199
	24·39	16·303	9·631
Deduct on account of pure water, 10 per cent.,			0·963
			8·668
Deduct also for making up for waste, 10 per ct.,			·866
			7·802

and we have in round numbers,

24′ of boiler heating surface per H. P. per Hall.
16′ " " " Pirsson.
8′ " " " Prosser.

To restore in the boiler the total heat lost in passing through the engine and condenser *without* making up for waste, but adding 25 per cent. for that and other purposes,* and to bring up the proportion to my standard of boiler heating surface, we have respectively 30′ per Hall, 20′ per Pirsson, and 10′ per Prosser of area of boiler heating surface per H. P. to put them on a par with each other.

* One of these purposes is to give a sufficient weight of water when evaporated for one H. P., in accordance with some observations which showed that more than 1 lb. per minute is required for 1 H. P., but as they are only comparative, it is of no importance whether the assumptions are strictly correct or not. They are also made on the supposition, that the same power is obtainable from the same weight of water under all the systems, thus eliminating all the saving into space occupied and fuel consumed.

The next question for consideration is the relative quantities of fuel which will be required. This will be directly as the quantity of heat to be restored in the boiler, and inversely at the *absolute power* in the steam* entering the cylinder. Therefore, assuming that Hall requires 10 lbs. of coal per hour per H. P., we have for

$$\text{Pirsson, } 8{\cdot}2798 = 10\ (\tfrac{662{\cdot}3}{752{\cdot}2},\ \tfrac{584388}{621144});$$
$$\text{Prosser, } 5{\cdot}1419 = 10\ (\tfrac{462{\cdot}4}{752{\cdot}2},\ \tfrac{584388}{698864}).$$

Allowing as follows, in accordance with previous calculations.

	Hall.	Pirsson.	Prosser.
Heat to be restored as per Table I,	616·8	596·1	559·4
Condensed in the cylinder, 18, 10, and 2 per cent.= $\frac{18}{82}$, $\frac{10}{90}$ and $\frac{2}{98}$ =	135·4	66·2	11·4
			570·8
Deduct in favor of pure water 10 per ct., and another 10 per cent. for making up for waste, . .	——	——	108·4
Heat required to be restored in the boiler,	752·2	662·3	462·4

The absolute power in the steam at 106°, 130°, and 180° C.=58,438 lbs. 62,144 lbs., and 69,864 lbs.* raised one foot.

Something is due, and no small amount either, beyond the value in mere °C. to the economy of fuel on account of the high temperature of the boiler feed water, I mean on account of the greater economy of combustion. Then there is greater, far greater facility for using the steam expansively, while the boiler itself (which is of a novel character,) is *perfectly* safe and occupies but a small space as compared with any other of equal power. As to durability also, it is unapproachable so far as can be judged of from nearly two years' experience, not the slightest deterioration being perceptible.

I shall therefore adjudge that, for full steam, the different systems require in round numbers.

10 lbs. of coal per hour per H. P. as per Hall.
8 lbs. " " Pirsson.
5 lbs. " " Prosser.

If any one supposes that the amount of condensation in the cylinder is an excessive allowance, I would refer to a case where it must have exceeded 40 per cent.,† and that too, in the case of a condensing engine worked with about the same pressure of steam as under Pirsson's system. With regard to that system, however, I may be permitted to explain, that I have used the term by way of distinction, on account of the more elevated temperature of the working steam and condenser over Hall's method, rather than as recognising any real difference in the principle of operation.

(To be Continued.)

*See Journal Franklin Institute, Vol. xxxvi, (3d Series,) p. 7, for the Absolute Power of Steam.
†Journal Franklin Institute, Vol. vii, (3d Series,) page 350.

Russian Inland Navigation.

(Continued from page 162.)

SYSTEM OF TYKVINE.—The rivers which form parts of this system are the Mologa, Tschagodvstcha, the Voltchina, the Tykvine, and the Sias.

Its construction was commenced in 1802, and the navigation was begun in 1811.

The Canal of Junction, which is at the summit level of the system, is about 4 miles long. It begins at lake Laibaidino on the Tykhvinka, traverses lake Kranpino, and terminates at the Voltchina, which flows through the lakes of Somino and Vojann to the Tschagadostcha river. The Voltchina leaves, between the Somino and Vojann lakes, the name of the Somino, and from the Vojann lake to the Tschagadostcha river it is known by the name of the Govionn.

The rivers Tykhvinka and Voltchina having been rendered navigable by means of locks, are fed by the water of the lakes Pyriatina and Dolgomostchinsky near the dividing point of the system.

The whole extent of artificial navigation from the last lock on the Tykhvinka, to the last lock on the Govionn, is 128 miles, of which 86⅔ miles are on the Tykhvinka, five miles are on the summit level canal and the lakes which it traverses, and 36⅓ miles are on the Voltchina, and the lakes through which it flows.

The locks of the Tykvine system *are of wood.* Their dimensions are conformable to those of the boats known as the Tykhvinki and Sominki boats, which carry burdens of from 20 to 25 tons, and are 65 feet long and 14 broad, with a draft of water of from two to three feet.

At the first establishment of the Tykvine system the navigation was not exempt from difficulties, because in consequence of *an error in the leveling*, too few locks were built. In this season, in the years 1812, 1813, and 1814, the deficiency was hastily supplied by a system of flood-gates. These demanded a large supply of water, and the navigation was subject to serious interruptions in consequence of injuries to the works, which were lightly built with reference to the very small fall, which they had to overcome during low stages of the water, amounting to not more than two or three feet, and were incapable of withstanding the heavy floods to which the Tykhvinka is occasionally liable. This circumstance rendered it necessary to transport a part of the cargoes by land between Tykhvina and Somino.

At present, the sluices having been gradually replaced by *locks with chambers*, the transportation of cargoes by land, between Tykhvine and Somino, has almost entirely ceased, and only occurs where the opening of the canal is retarded in consequence of a late spring.

According to existing arrangements, the boats which carry cargoes, being bound to get through in a given time, are only occupied three days in passing through the whole distance occupied by the locks on the Tykvine system, and the whole trip of 551 miles, by this water,

between Rybinsk and St. Petersburg, is made in from three to four weeks. The average cost of transportation for this distance is $8·37 per ton.

The number of boats which annually pass through the Tykvine system, is about 2460 going towards St. Petersburg, and 560 going toward Rybinsk. They take to St. Petersburg about 51,428 tons, and to Rybinsk, nearly 14,464 tons.

These cargoes consist principally of valuable merchandise, such as wheat, flour, potash, copper, hides, dye-stuffs, colonial produce, manufactured articles, &c., &c.

MARIE SYSTEM.—To this system belong the rivers Scheksna, Kovja, Vytaigra, and Svea.

In order to pass from the Scheksna into the Kovja, the boats had to traverse the Bailvagevo lake, where the navigation encounters great inconveniences, particularly at the entrance into the lake. The cargoes had to be transhipped from the river boats into vessels provided with decks; on the lake itself, adverse winds caused great delays, and during storms many vessels are lost, until these inconveniences were removed by the canal of Bailosersk, around the shore of the lake, between the mouth of the Kovja and the outlet of the Scheksna. This canal was begun, by order of the Emperor, in 1843, and finished in 1846.

The length is 40 miles and 4809 feet, the breadth is 77 feet at the surface of the water, and 56 feet at the bottom, and the depth is about seven feet.

The canal begins at the Scheksna $4\frac{2}{3}$ miles below its head, and terminates on the Kovja a short distance above its mouth.

Considerable difficulties are encountered in navigating the first $4\frac{2}{3}$ miles of the Scheksna, in consequence of the rapidity of the current, and the shallowness of the channel, which is also very crooked.

The point of departure of the border canal of Bailosersk, has therefore been chosen $4\frac{2}{3}$ miles below the port of Krokhino, or the outlet of the Scheksna from the Bailogera lake. At this point the depth is sufficient, and there is a considerable expansion of the river, and a very moderate current.

The level of the canal was fixed at 13 feet above the level of the Scheksna, and six feet and a half above that of the Kovja. *Two wooden locks* have been built for their purpose at the Scheksna end, and one at the Kovja end.

The canal is fed by means of the Konnost river, *and by immense reservoirs* formed by the lakes of Lak, Asatsk, and Fle, having an area of about 11,250 acres.

Several rivulets which empty into Bailvogera lake, on the southern side, increase the supply still further by the tribute of their waters. The Maigra, the most important of them, is closed by a retaining dike. In this way the boats, avoiding Bailvozera lake, pass from the Scheksna to the Vytaigra. The Marie canal has been built to open the passage from the Vystaigra to the Kovja.

This canal, the construction of which was begun in 1799, was opened for navigation in 1810.

The Canal of Junction, established at the summit level of the system, is about five miles long, and passes through the lake Malko-Ozero.

The navigation encounters no obstacle in the Kovja in the 28 miles of its course from its mouth to lake Bailo-Ozero, nor on the Vytaigra in the $6\frac{3}{4}$ miles from its mouth at lake Onega.

As to the upper part of these rivers, that of the Kovja for an extent of $23\frac{1}{2}$ miles, and of the Vytaigra for $39\frac{1}{3}$ miles, to the Canal of Junction, they could not be rendered navigable otherwise than by a system of locks fed by the Malko-Ozero lake, which constitutes the dividing point of the system, and by the lake of Kovja, the waters of which are conducted to the same dividing point by a feeder about $6\frac{3}{4}$ miles long. The extent of the artificial part of the system of Marie from the last lock on the Kovja to the last one on the Vytaigra, is $68\frac{3}{4}$ miles. Boats lightly loaded traverse this distance in three days, and those fully charged, are about eight days in making the same trip. The locks of the Marie system *are wood* with dimensions suitable for the class of boats which make use of them. These boats are about 84 feet long and 28 broad. They draw about four feet of water and carry about 150 tons.

Among the locks on the Vytaigra *several have two and three chambers, and one has four.* The dikes established near these locks raise the water to a great height, and in particular the dike near the lock, of three chambers of St. Paul, supports a head of water 35 feet in height, and is one of the most remarkable hydrotechnical works in Europe. The river Vytaigra falls into the Onega lake, from which issues also the river Svive. In order to avoid the necessity of entering the lake, the Onega canal has been established, which, however, is not yet fully completed, for the entire distance between the mouth of the Vytaigra, and the inlet of the Svive.

Canal of Onega.—The construction of this canal was begun in 1818. The part completed is 12 miles and 3490 feet in length, and is 70 feet wide on the bottom, and eight feet deep. It extends from the mouth of the Vytaigra to the bay of the Onega lake, known as the Tchornay Pessok (black sand) bay. This part of the canal was opened for navigation in 1820.

The following circumstances have induced the establishment of this part of the Canal Onega. The Vytaigra river affords, from the city of that name to the Onega lake, with a moderate current, a channel everywhere sufficiently deep, but the mouth itself is liable, during north winds, to be obstructed with sand-bars, so that before the construction of the Onega canal, particularly in autumn, when the navigation is very active, the barks were obliged *to be towed by row-boats*, which involved very considerable expenses, and retarded the arrival of the cargoes at St. Petersburg. Besides this, the barks after clearing the river, had to turn a cape, which projected some miles into the lake, and which occasioned frequent shipwrecks. All these inconveniences are prevented by the establishment of the first part of the Onega canal.

At present the whole canal is almost finished, and it will probably be entirely so, and opened for navigation in 1852.

This second part of the canal, which was begun in 1820, after the completion of the first portion has been made for the purpose of shortening the time occupied in crossing the lake towards the outlet of the Svier, distant only 12 miles from the mouth of the Maigra, the channel of which has at all seasons a depth more than sufficient to admit the passage of barks with the heaviest loads. The distance from Rybinsk to St. Petersburg by the way of the Marie system, is 702 miles. The barks carrying loads of from 80 to 150 tons, make the trip under favorable circumstances in 40 or at most 45 days.

The canal of Bailo-Ozero has entirely removed the inconveniences encountered on the Marie system in consequence of the necessity of crossing the Bailo-Ozero lake; this system on account of the large dimensions of the barks which navigate it, the depth of the channel, and the certainty of passing through it in a fixed time, and finally, in consequence of the rapidity with which the trip is made, constitutes the best navigable communication between the Volga and the Baltic Sea.

Loaded boats at present only traverse this system in the direction towards St. Petersburg. About 1600 boats pass annually, carrying about 216,965 tons. The average cost of transportation from Rybinsk to St. Petersburg is $5·38 per ton.

By the three systems, which have just been described, viz: those of *Vishney Volotchock, of Tykvine, and of Marie*, vessels reach the Ladoga lake. For avoiding this lake three canals have been established, viz: those of *Svir, of Sias, and of Ladoga.*

Canals constructed for avoiding the Ladoga Lake.—The Svir canal is built between the mouths of the Svir and Sias rivers.

This canal was commenced in 1802, and opened for navigation in 1810.

Its level, as well as that of the Sias, *is the same as that of the Ladoga lake*, and there is, consequently, no necessity for locks.

Its length is 24 miles and 3655 feet, and its breadth on the bottom is from 63 to 105 feet. Boats can navigate it with a draft of water of about five feet. A steam dredging machine is employed for removing the deposits of earth which are formed in the Svive canal, and still more in the neighborhood of the mouths of those streams, and at the intersections of the Svive canal with the rivers of Voronona, Visika, and Pelgowka.

The end of the Sias canal, near the Volkhov river, is most exposed to the deposits, arising from the fact, that its direction is contrary to that of the current of that stream.

The Sias canal has been dug between the mouths of the Sias and Volkhov rivers.

The works were begun in 1764, and were, for various reasons, frequently interrupted. It was opened for navigation in 1802.

The level of the canal is that of the lake. Its depth corresponds to the varying height of the lake waters, so that when the lake is lowest

there is still depth enough for navigation. There is, consequently, *no necessity for locks*, and the only hydrotechnical works which are found on it, are the paths and the revetments of the banks. The canal is $6\frac{2}{3}$ miles long, and 70 feet wide on the bottom. Boats can navigate it with a draft of water of about five feet.

The canal of Ladoga is built between the mouth of the Volkhov river and the inlet of the Neva from Ladoga lake.

On the 22d of May, 1722, Peter the Great, surrounded by his ministers, generals, and senators, after having heard mass, was the first to take a shovel and begin the excavation of the Ladoga canal. He filled a wheelbarrow with earth three times, and wheeled it a considerable distance, and deposited it. The lords of the court all imitated the example of their august master.

The navigation of the canal was begun in 1731. It is $69\frac{1}{3}$ miles long, and from 70 to 98 feet wide on the bottom. It may be navigated by boats drawing five feet of water.

The canal has two arms or branches, one at its junction with the Neva, near the city of Schlusselburg, and the other at its junction with the Volkhov, near the city of Novaga Ladoga. The principal hydrotechnical works, are the locks built at each of its mouths, and seven waste weirs placed in the beds of the stream, which connect the canal with Ladoga lake.

The waste weirs keep the navigable level of the canal waters at a constant height, while those of the lake are subjected to periodical variations. It has been observed that the waters of the lake *rise during a period of seven years, and fall during as many more.* The variations in the lake level have not yet been determined exactly, but the greatest difference observed between the levels of the canal and of the lake is seven feet.

All these works have been built anew under the reign of his Imperial Majesty the Emperor Nicholas. The locks at the Neva end, and the waste weirs into the lake, are built of granite. At the Volkhov end, the locks are of brick masonry, wood being only employed for cornice, mitre, tills, &c.

The locks at the Volkhov end of the canal afford five passages for water at the same, two chambers being at the old mouth of the canal, and three at the new one. At the Neva end there are six openings, of which four are side by side at the old mouth of the canal, and two at the new one.

This augmentation of the means for passing the boats from the Ladoga canal into the Neva, has been induced by the difficulty which was experienced in the passage of boats by the old outlet of the canal into the Neva, when the wind was contrary. The mouth called the old one, at Vovaja Ladoga was established in 1761, that is to say, at a time whereof the number of systems, which at present connects the Baltic with the Caspian, only one was in existence, viz: that of Vishney Volochock, and when, consequently, all the boats which arrived at Vovaja Ladoga to take the Ladoga canal, descended the Volkhov river, from which the entrance of the boats into the locks of the old

mouth was very easy. The canal of Siass was afterwards built, forming a part of the navigable systems of Bykhvinka and Maurice. The mouth of the Siass canal at the Volkhov is below that of the Ladoga canal about two-thirds of a mile. To avoid the necessity of ascending with the canal boats against the stream, an operation which is very difficult when the wind is ahead, it has been found necessary to make a new mouth for the Ladoga canal, opposite to the point where the Siass canal enters the Volkhov.

The chambers of the locks at Schlusselburg at the new mouth, are 231 feet long, and 30 feet broad, and at the old mouth they are 175 feet long, and 30 feet broad. The chambers of the locks at the new mouth at Schlusselburg *have from four to six gates*, in order to permit the more speedy passage of small boats, such as those of the Tykhvine and Svimnki and passenger boats, and to economize water. The full length of the lock chambers is intended for floats of timber.

The Ladoga canal *is fed by means of reservoirs.* The place where the artificial reservoirs are constructed, is situated in a great morass, beginning near the city of Ladoga and ending at the Kubana river. This morass is bounded on one side by some high ground, on which passes the post road of Faroslav leading from Schlusselburg to Novaja Ladoga, and on the other by Ladoga lake. Lengthwise, this marsh is almost entirely level, but transversely it slopes towards Ladoga lake.

Before the Ladoga canal was built, the small streams flowing from the morass to the lake drained off the snow and rain water freely, but when the canal banks stopped this free flow, the water begun to accumulate in the low places, and these formed artificial lakes, which are the present reservoirs. Another sandy elevation, the Korovj Khraibet, divides this same morass in the direction of its length, into two parts, which are nearly equal. In this way the Korovj Khraibet is separated from the post road by the morass, and from the canal *by the reservoirs.*

Detailed researches into the actual condition of the reservoirs of the Ladoga canal have demonstrated: 1st, that the quantity of water which they contain, when up to their full level, as well as that in the contiguous morasses, whence they are supplied with water, estimated by means of formulas at the time of the flowing of the water over the waste weirs of the reservoirs, amounts to 1,680,700,000 cubic feet. 2d, the quantity of water which the reservoirs, properly so called, *contain, when full*, as before estimated by means of transverse profiles, amounts to 968,975,000 cubic feet. It follows from this, that the marshes contiguous to the reservoirs, when full, pour into the reservoirs a mass of water equal to 711,725,000 cubic feet, but during dry summers, the water contained in these vast morasses evaporates before the period when it is necessary to feed the canal by the water in reserve, and then, during the dry period, the marshes absorb the reserve water, and serve as conductors to a more rapid evaporation.

Admitting, from the result of experience, that in a dry time, *a layer of water two feet thick is evaporated*, there would still remain in the reservoirs about 51,450,000 cubic feet of water which may be used for the purposes of navigation.

In 1826, two steam engines were constructed for the purpose of supplying the canal with water by pumping it from the lake, *but it has not been found necessary to make use of them.* All the vessels proceeding to St. Petersburg by the three systems of Vishnii Volotchock, Tykhvine, and Marie, pass through the Ladoga canal. The weight of the cargoes transported to St. Petersburg by this canal, annually amounts to 4,098,213 tons. The weight of the cargoes sent from St. Petersburg to the interior by the Ladoga canal amounts to 19,286 tons. The number of boats of all descriptions, which pass through the canal, annually amounts on an average to 20,000.

Independently of the systems which have just been described, there are to be included among the number of the channels of artificial navigation having St. Petersburg as their centre, the following, viz: The Moscow Canal and the canal of the Duke Alexander of Wurtemburg.

The project of a water communication between the Tstra and the Sestra was prepared for the purpose of extending the navigable system of Tykhvine to Moscow, so as to furnish the means of accelerating of cargoes from St. Petersburg to the interior of Russia, and *vice versa*, and also, for the purpose of replacing by a commodious navigation, the transportation of merchandize by land, which annually takes place between Moscow and the landings of Rogatchev and Schocha (on the Volga), and also to facilitate the conveyance to Moscow of timbers and wood. The execution of this project was commenced in 1826.

The Canal of Junction between the Tstra and Sestra is $5\frac{1}{3}$ miles long. It constitutes the summit level of the system. A reservoir has been here established having a superficial area of 1968 acres, and containing about 617,400,000 cubic feet of water. Assuming that about 300 boats pass through the canal loaded with 120,500 tons, the annual expense of water has been calculated to be 134,350,000 cubic feet, and according to observations made for several consecutive years, *this quantity of water is every year renewed in the reservoir.* In case the navigation on these two rivers should exceed the estimated amount, it is proposed to augment the supply into the reservoir, by conducting to it the water of the river Khazina, and those of the lake Tiastenskoidi, which is not far from the summit.

The new navigable route is from Moscow to the Volga, $182\frac{2}{3}$ miles long, in which distance are included $43\frac{1}{3}$ miles of the upper part of the Moskwa river, 57 miles of the course of the Tstra, $8\frac{2}{3}$ miles of canal along the banks of Tstra, the summit canal $5\frac{1}{3}$ miles long, $41\frac{2}{3}$ miles of canal along the banks of the Sestra, and finally, 20 miles of the course of the Sestra, and $6\frac{2}{3}$ miles of that of Donbna.

The locks are of brick masonry *covered in some places with cast iron plates;* of these there are two on the Donbna, twenty-four on the Sestra and the canal along its banks, eighteen on the Tstra, and five on the Moskwa.

The dimensions of these locks are the same as those of the locks of the Tykhvine system, that is to say: 91 feet long and 15 feet wide. It is proposed, however, to make the two locks at the extremities of the system, that is to say, of a lock on the Donbna, on one of the

canals which circumscribes Moscow, of larger dimensions, in order that the larger arks which navigate the Volga between Tver and Rybinsk, and those on the lower port of the Moscowa, between Moscow and Rolumna, may pass through these locks and discharge their cargoes at the landing established above them, so that they may be carried further by the Tstra and Sestra.

For this purpose the Donbna lock has been made 154 feet long and 30 feet wide, in order that the barks of the Volga may pass it, and that of the canal around Moscow has been made 210 feet long and 42 feet wide, so as to conform to the dimensions of the arks, which navigate the Moskva river. This lock, called Kvasnoi Kholm, has two chambers, the total lift being 12½ feet, which is the difference of level between the canal of circumference and the Moscow river at its low stage.

In this way the canal around Moscow, dug from one part of the river to the other through a marshy flat, serves as a junction between the navigation of the Sestra, Tstra, and the upper part of the Moskva, and that coming from the Oka, and traversing the lower part of the Moskva, which formerly terminated at the stone bridge near the Kremlin.

The cost of establishing the new water communication between the Volga and the Moskva, including that of constructing the locks on the upper part of the Moskva, and the canal around the city of Moscow is $3,000,000. In the sequel this project having undergone important modifications, the works have been stopped, and at present a new project is being prepared for this important route.

The canal of the Duke Alexander of Wurtemburg is built between the Scheksna, which forms part of the system of Marie and lake Kubinsk, from which issues the Sukhona, a tributary of the northern Dwina.

This canal was commenced in 1823, and opened for navigation in 1828.

It leaves the Scheksna at a point 6⅔ miles from the city of Risilof, and passing through the lakes Siversk, Babyai Zavnlomsk, Vasirinsk, Lirhemsk, and Blazvoraistchensk, terminates at the river Porosovitza, which falls into the lake Rombensk.

The different sections of canal have together a length of about 10⅔ miles, and the distances through the different lakes make in all about 8⅔ miles.

Two small rivers, which serve to join some of these lakes, and the Porosovitza river taken together, have a length of about 26⅔ miles.

Thus the entire artificial system of the canal of the Duke Alexander of Wurtemburg is about 46 miles long.

The summit level, or dividing point of this system of navigation, is the lake Vasirinsk.

From this the other lakes are stretched out both on the side of the Scheksna, and on that of the Porosovitza.

The passage from one lake to another, and that into the Scheksna, as well as the navigation on the Porosovitza, are effected by means of locks. These locks *are of wood*, with dimensions similar to those of the locks of the systems of Marie.

The boats or arks which navigate this canal, carry about 150 tons. They draw about four feet of water, and are 84 feet long and 28 feet broad.

Although the canal of the Duke Alexander of Wurtemburg has not upon it so active a trade as the other systems of navigation, nevertheless it now passes 130 boats going towards the Scheksna river, and 50 going towards the Rombensk lake. The cargoes going towards the Scheksna, each season, amounts to about 13,000 tons, and those going towards the Rombensk lake to 1000 tons.

(To be Continued.)

For the Journal of the Franklin Institute.

On the Efficiency of the Steam Casing or Steam Jacket in Steam Engines. By GORDON MCKAY, ESQ.

The importance which the steam engine has assumed in the industrial affairs of the world, its universal use, the amount of money daily expended in keeping its strong arm in motion, and the extent to which it affects the interests of every member of society, render any investigation of its principles, whereby new features are developed, or old, and partially neglected ones resuscitated, and shown to be valuable, of importance sufficient to excuse me for seeking a space in the pages of your valuable *Journal*, to lay before the public the results of some experiments, made with the view of testing the efficiency of the "steam casing," or "steam jacket," on the cylinder of the steam engine.

I was led to these inquiries by noticing the almost universal neglect of this principle, in this country, particularly in non-condensing engines, and by the equally universal application of it to the Cornish condensing engines in England, where the highest economical results have been attained, and this question suggested itself. Is the steam jacket economically applicable only to the condensing engine?

It may be well here to describe what the steam jacket is. Although the history of the steam engine, and its various parts, have now become almost as familiar as household words to the engineer, there may be some who will read this article, by whom the term is not understood. The "steam jacket" was an invention of Watt's, and forms the first claim in his patent of 1769, the principles of which he describes in the following words: "First, that vessel in which the powers of steam are to be employed to work the engine, which is called the cylinder in common fire engines, and which I call the steam vessel, must, during the whole time the engine is at work, be kept as hot as the steam that enters it. First, by enclosing it in a case of wood or any other materials that transmit heat slowly. Secondly, *by surrounding it with steam or other heated bodies, &c.*" This he did by making the cylinder of his engines double, or one cylinder within another, the space between them being filled with steam taken from the boiler, and having its full pressure and consequent temperature. The outside cylinder was encased with wood, or other non-conducting substance, to prevent loss of steam in the jacket.

There are many engineers of high standing, who deny the efficacy of the steam jacket, and consider protecting the cylinder by non-conductors, as the utmost limit to which it is possible to carry economy in this direction; and they argue with some plausibility, that the cylinder will require just as much steam to keep it at a certain temperature if heated from the outside by a jacket, as it will if heated by the steam used in the cylinder to propel the machinery, while the jacket, necessarily having a greater radiating surface, will radiate more heat externally, and hence prove a positive injury. To ascertain the economy of the steam jacket, to what extent it is economical, and for what reason it is so, was the object of my experiments.

With this view, I had a small steam engine and boiler made. The boiler was a vertical one, about two feet in diameter, and six feet high, having an internal fire box and tubes. The engine was attached to the boiler, the cylinder being at its upper end, and placed above the water line in the boiler; and the shaft and balance wheel below. The valve is what is known as the lap valve, so arranged as to cut off the steam at one-half stroke. The cylinder was two inches in diameter, and the stroke eight inches; it was jacketed, and steam conveyed from the boiler to the jacket by a pipe, and the water condensed in the jacket, carried back to the boiler by another pipe, discharging below the water line into the boiler. Cocks were so arranged in these pipes that the steam could be cut off from the jacket altogether, or be admitted to it, and the condensed water returned to the boiler, or be taken from the jacket in a vessel and not returned to the boiler.

A dynamometer was applied to the balance wheel to measure the power, and a counter attached to the engine shaft to record its revolutions. A glass water gauge indicated the height of the water in the boiler, and a graduated scale on the gauge, the weight of water that the boiler contained. This scale was adapted to the expanded state of water at a temperature of 342°. The reservoir which supplied the force pump, was placed on a platform scale, and the water taken from it to the boiler carefully weighed. The boiler had also a steam pressure gauge, and during the experiments, the pressure was maintained at 115 pounds with great accuracy. The exhaust steam of the engine was used to make the draft, which was regulated by a closely fitting door in the ash pit, by adjusting which, the steam pressure could be regulated with great facility, a variation of one pound either way from 115, would cover the errors arising from that source. The cylinder of the engine was encased outside the steam jacket, with cotton about four inches thick; and during the experiments the safety valve was not allowed to lift.

The engine, when completed, was kept in motion for about fourteen days, in order to get it in such a state that its friction and leakage would remain constant during the experiments; and care was taken that the oiling should be alike in each case.

The first experiment was made with steam in the jacket, the condensed water being returned to the boiler.

The pressure on the boiler was	115 pounds.
The initial pressure in the cylinder was	95 "

(This was obtained by indicator diagram).

The weight on the dynamometer scale, 7½ pounds, corresponding to about 1 horse power.

The duration of the experiment,	8 hours.
The revolutions made,	97,440
The water evaporated from the boiler,	485 pounds.

By a subsequent experiment, the water returned to the boiler from the jacket, was ascertained to have been 15·7 pounds for the 97,440 revolutions. Making the whole water evaporated, 500·7 pounds.

The second experiment, without steam in the jacket, was continued eight hours, but the number of revolutions was a little less than in the first case, and the results as to water evaporated, have been corrected to correspond with the number of revolutions in the first experiment, to facilitate comparison.

The initial and boiler pressures, the same as before.

Weight on dynamometer the same.	
Duration of experiment,	8 hours.
Revolutions (corrected),	97,440
Water evaporated,	630 pounds.

These experiments were then repeated with sensibly the same results.

From a measurement of the size of the steam ports, clearance, and fill, of the cylinder, a computation of water (as steam) required to supply the engine for 97,440 revolutions, with 95 pounds pressure, gives 321 pounds. Hence, in the first experiment we have the following:

Revolutions,	97,440	
Initial pressure,	95 pounds.	
Boiler "	115 "	
Water used in the engine, as computed,	321	
" condensed in the jacket,	15·7	
" used in leaks of joints, boiler, &c.,	164·0	
Total water evaporated,		500·7 "

In the second experiment (without jacket), we have,

Revolutions,	97,440	
Initial pressure,	95	
Boiler "	115	
Water used in leaks of joints as before,	164	
" used in the engine,	466	
Total water evaporated,	630 pounds.	
From the above it is evident that the water used in the engine and jacket was	321+15·7=336·7 "	
While in the second, without jacket, the water used was	466 "	
Showing a saving by the jacket of	129.3 "	
Or if the leaks be added, the result is the same,	336·7+164=500·7 "	
	466·0+164=630·0 "	
Difference,	129·3 "	

I think this result clearly shows the jacket to be economical, and in this instance the economy amounts to a saving of 129 in 466 of the

necessary quantity of steam, if there had been no leaks; or of 129 in 630, with leaks to the extent of the present case, or about 27 per cent. without leaks, and about 20 per cent. with leaks.

The question now arises, will this ratio hold good in all cases, and upon what principles is the saving by use of the jacket, or rather the waste (condensation), for the want of one to be computed.

Let us trace the action of steam through one revolution of the engine. The valve is opened, at the commencement of the stroke, and steam enters the port, and space between the cylinder head and the piston; all the surfaces surrounding these spaces are at a lower temperature than the steam, and a portion of it is condensed by imparting its heat to the surrounding surfaces. The piston now begins to move, and as it passes onward exposes new condensing surface to the steam, and more is condensed, and this process continues until the cut-off valve closes, and expansion of steam commences in the cylinder. At this point the cylinder is to a certain extent, in the same condition as the boiler, containing steam and water, and as the piston advances and the pressure is decreased, the water in the cylinder is again converted into steam, and thus if the expansion is continued long enough, the whole condensed water is re-evaporated. The exhaust valve now opens, and the return stroke of the piston is made, with a temperature of steam corresponding to the exhaust pressure. From these considerations, I think it evident that condensation will be as the *extent of condensing surface up to the point of cut-off, and as the number of revolutions*, it will also doubtless be effectual by the difference of initial, final, and exhaust temperatures. Precisely what effect these temperatures will have, I am at present unable to state, my experiments extending only to pressures as stated before.

The steam condensed in the cylinder of a steam engine, has been heretofore stated as a certain per cent. of the steam used, and attempts have been made to ascertain that per cent. for different degrees of expansion; but it is evident that if the condensation depends upon the condensing surface, no per centage of the steam used can be given which will apply to cylinders of all sizes; as the ratio of condensing surface, to the capacity of the cylinder, will vary in almost every engine. Let the condensation then be computed per square inch per stroke, and in the present instance it will be found thus: The whole condensation is given as 129·3 pounds, or 3581 cubic inches, which divided by the number of strokes, 194,880, is ·01837, this divided by the square inches of condensing surface which was rendered non-condensing by steam in the jacket, 23·55, gives the quantity as ·00078 cubic inches of water condensed by each square inch of unjacketed surface in the cylinder at any stroke of the piston; and this may be considered as correct for engines having initial and exhaust pressures corresponding to the one experimented upon, viz: initial, 95 pounds, and exhaust 17 above a vacuum.

In addition to the above method of ascertaining the condensation, I have obtained nearly the same result from a locomotive, where I had an indicator diagram taken with nearly the same initial, and exhaust

pressures, and where the condensing area, and dimensions of the cylinder were known. The excess of water in the state of steam in the cylinder at the end of the stroke, above that at the point of cut-off, as shown by the steam pressures at these points, amounted to ·0008 cubic inches per square inch of condensing surface; a quantity a little greater than that obtained in the experiment, yet so near as to be corroborative. It may here be remarked, as illustrating the truth of the assertion, that the condensation is as the surface and as the strokes, and not a per cent. of the quantity of the steam used, that the ratio of condensing surface to the contents of the cylinder, was in the experimental engine, as 14 to 35, while in the locomotive it was as 16 to 12 and the revolutions as 200 to 168.

The next inquiry that suggests itself is, how can this saving in the use of the jacket be accounted for? I think the answer will be found in the fact, that if heat be taken from the steam inside the cylinder to maintain its temperature, the only heat that is available for that purpose, is the sensible heat, that is, the difference of the temperatures due to the initial, and final pressures; or in the experiment cited before 328°—220° = 108°, 328° being the temperature of steam at 95 pounds pressure, and 220° that of steam at 17 pounds pressure. It may at first seem that the latent heat is applied to heating the cylinder, inasmuch as the steam is in part condensed, as shown by the diagram of the locomotive cylinder, and therefore its latent heat must be evolved. But it also seems from the locomotive diagram, that the same water was reconverted into steam, thereby resuming its latent heat, hence the sensible heat is all that remains in the cylinder. While if the steam is used in the jacket, the latent heat is applied to the cylinder, and this amounts in the present instance to 1202°—342° = 860°, 1202° being the total heat in the steam, and 342° the temperature of the water that was returned to the boiler from the jacket. If this solution of the question is correct, the product of the condensed water inside the cylinder, multiplied into the temperature assigned to it, should equal that of the water in the jacket, multiplied into its temperature, or 129·3 × 108° = 13,964, which should equal 15·7 × 860° = 13,502.

The result is not exact, but sufficiently so to induce considerable confidence in the theory.

The preceding experiments and deductions are not by any means sufficient to enable me to determine fully the laws which govern the condensation of steam in a cylinder, they only fix one point for one degree of expansion, and one final and initial temperature, and in order to a full investigation of this interesting subject, more extensive experiments are necessary. They are however sufficient to show that the steam jacket is not a mythe, but has a real value which can be accounted for on sound principles, and also that it is advantageously applicable to non-condensing as well as to condensing engines.

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REMARKS.—*Hirn's Experiments on the Steam Jacket.*

The interesting communication of our correspondent, reminds us that we have had lying upon our table for some months, a long memoir

upon the subject of the steam jacket, communicated to the Industrial Society of Mulhouse, by G. A. Hirn, and read before that Society, on 25th April, 1855.

The experiments of M. Hirn were tried upon an engine of Woolf's construction (double cylinder with expansion and condensation), and each experiment lasted a day. The machine, with its jacket in action, with a pressure of 3·75 atmospheres in the smaller cylinder, gave 104 horse power; when the jacket was not used, with the same pressure, and all other circumstances the same, it gave 79·5 horse power; showing a gain of 23·5 per cent., which agrees very well with the results of our correspondent.

We propose, when we can find leisure, to condense the very valuable memoir of M. Hirn for our readers. In the mean time we give his conclusions.

1. The steam jacket produces a saving of power of 23·5 per cent. in a condensing and expanding engine.

2. The jacket does not act by avoiding the external loss of heat.

3. It owes but a small part of its useful effect to its power of drying the steam.

4. It owes but a small part of its useful effect to the excess of expansion of the vapor (acting as a gas), from the greater heat of the walls of the cylinder.

5. When saturated steam expands without additional heat, it is partially condensed; *and the prevention of this condensation is the origin of the economy of the steam jacket.*

6. The actual economy of fuel produced by the steam jacket is but 22·2 per cent., and not 23·5 per cent., as was deduced from the comparison of the powers.

7. No other practical means has yet been found to replace the action of the steam jacket.

He recommends as secondary means of increasing the useful effect of the engine:

First, to surround the steam jacket with the smoke flue, as suggested by M. Dollfus; and

Secondly, to keep always the steam in the boiler, and consequently that in the jacket, at the highest pressure possible.

On an Improved Construction of Axle-boxes and Coupling-rods for Locomotive Engines. By Mr. William A. Fairbairn.*

[Read before the Institution of Mechanical Engineers.]

This construction of axle-box has for its object the introduction of an elastic cushion or spring of vulcanized india rubber between the axle-boxes and framing of locomotive engines, for the purpose of allowing the wheels to accommodate themselves to curved portions of the railway, and thus to diminish the wear on the flanches of the wheels and on the faces of the axle-boxes. The india rubber spring is placed in recesses formed in the jaws of the horn plates upon each side of the axle-box, and a metal plate, with a smooth case-hardened surface, is

*From Newton's London Journal of Arts, February, 1859.

interposed, upon which the axle-box slides vertically with the inequalities of the road. The force of the spring-action of the india rubber is made sufficient to keep the axles of the wheels at right angles to the straight portions of the railway, but to yield to the friction of the rails upon the wheels in curved portions, and by this means to allow the axles to assume such a position as will place the wheels at a tangent to the curve. The elasticity of the india rubber serves also to keep the axle boxes at all times in close contact with the faces of the horn blocks, so as to secure a good fit, and obviate the necessity for that constant lining which they ordinarily require, in consequence of the wearing away of the working faces.

That the leading and trailing wheels may have still further flexibilty of adjustment, a small play is permitted to the axle-box laterally, in the direction of the axle, by making the recesses in the axle-box, which receive the face-plates, wider than the plates themselves by $\frac{1}{2}$-inch. But to keep the axle-boxes in position in straight portions of the road, these plates are made wedge-shaped in plan, so that the elastic pressure of the india rubber on the face-plates restores the axle-boxes to their central position, whenever the pressure on the flanches of the wheel is relieved. The inclination of the wedge is made such that $\frac{1}{4}$-inch movement of the axle-box laterally, in either direction, compresses the india-rubber $\frac{1}{8}$-inch.

The india rubber is employed in the form of rings or washers $1\frac{3}{8}$-inch thick; and it is found convenient, in order to maintain an accurate fit between the working surfaces of the axle-boxes, that these washers, when in position, should be compressed $\frac{3}{16}$-inch, which is equivalent to a pressure of about 1 ton on each side of the axle-box, tending to maintain the contact of the working surfaces. With this pressure, the axle-boxes slide more freely on the case-hardened surface of the plates, than in the usual construction; whilst the motion which permits the wheels to accommodate themselves to the curvature of the road does not in the least increase the oscillation of the engine, and prevents the excessive wear of the shoulders of the journals and the flanches of the wheels, which are such fertile causes of unsteadiness in ordinary engines.

In the case of the driving-wheels of the engine, it is not advisable to allow so much play to the axle-boxes; and hence, whilst the admirable fit between the working surfaces obtained by the above arrangement renders its employment advantageous, it is modified in this case by the use of a band of india rubber, $12\frac{1}{2}$ by $2\frac{1}{2}$ inches, and $\frac{3}{8}$-inch thick, covered by a wrought iron plate, case-hardened as before, but not wedge-shaped, since in this case all lateral play is to be avoided. A longitudinal play of $\frac{1}{32}$-inch only is allowed on each side, between the case-hardened plate and the horn-blocks, to permit the action of the india rubber spring, which is compressed in this case, so as to exert an initial pressure of about 15 tons on each side of the axle-box, to resist the action of the force driving the engine. Notwithstanding this large pressure on the working faces of the box, it is found, in practice, to fall readily with the weight of the wheel itself. In the case of the driving-wheel, the advantage derived by this construction does not

consist in the adjustment given to the wheels, but in the perfect fit at all times maintained between the sliding surfaces; the elasticity of the india rubber also forms an elastic cushion to receive the shocks of the machinery. A small strip of leather prevents the oil from gaining admission to the india rubber. The perfect freedom of motion, the small wear of the axle-box, in consequence of the case-hardening of the slides, the ease with which the engine passes curves, and the diminished wear of the wheel-flanches, are important advantages, which have been derived, in practice, from this construction of axle-box.

A similar application of an india rubber spring to the outside coupling-rods of an engine had also been made. In this construction of rods, the use of cotters for tightening the brasses was dispensed with, by employing a set-screw at the end of the rod, secured by a lock nut, from risk of working loose.

Mr. W. FAIRBAIRN showed a specimen of the india-rubber lining from an axle-box that had run 17,000 miles in a locomotive engine; also, a model of the axle-box fitted up with india rubber, and a specimen of one of the connecting-rod ends. He stated that it was requisite to take great care to keep oil away from the india-rubber; as in one trial, the india rubber had lasted only a month, from neglect of this precaution; but when properly protected from oil, its durability was found to be very great. A cap was now fixed over the india rubber, as a more complete protection for this purpose. These axle-boxes and connecting-rods were working in several locomotives on the Chester and Birkinhead Railway, and they were found to be now as good and perfect as when first put in, though some had run as much as 17,000 miles; they were considered quite satisfactory, and the result of the axle-boxes was an improvement in reducing the wear of the wheel flanches. The connecting rods were screwed up at the ends, instead of being cottered as in the usual manner; and this mode of construction he considered an improvement as regarded convenience and security from accident.

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*Description of an Improved Railway Switch.** By Mr. JOHN A. HASWELL.

[Read before the Institution of Mechanical Engineers.]

In the various kinds of switches now used on railways, the moving tongue slides upon the chairs, rubbing upon them throughout the extent of its motion; and the switches are made self-acting by a balance weight, hanging from the lever, and constantly pressing the tongue home to the side of the main rail. But in practice this plan is found defective; for although a weight is employed as heavy as can be conveniently worked, its action is uncertain,—being frequently impeded by the friction of the sliding tongue, from the chairs having become dry, or the oil becoming adhesive or mixed with sand and ashes. The tongue-rails are then liable to remain on the wrong side, or only partially reversed,—thus presenting both tongues open, and causing danger of accident, from wheels running off the rails, by the flanches

* From Newton's London Journal of Arts, February, 1859.

entering between the tongues and main rails at both sides. To lessen this defect, a raised strip has been used upon the rubbing part of the chairs, which reduces the surface for holding sand; but this plan involves the objection of the oil being sooner rubbed off by the motion of the tongue, from the increased pressure between the rubbing surfaces. The large consumption of oil that takes place with the ordinary switches, forms a serious item of expense,—most of the oil that is applied being unavoidably wasted.

The new construction of switches described in the following paper, which is the invention of Mr. Edwin Thompson and Mr. William Nicholson, of York, is designed to remove this difficulty, by avoiding the sliding of the tongue-rails upon the chairs, and so dispensing entirely with the use of lubrication.

The tongues are of the ordinary form; but a short iron strut or link is jointed to the thin end of each tongue-rail and to the end chair, so that, when the tongue-rail is opening, this strut causes the end of the tongue to rise off the chairs, and the other tongue at the same time descends upon the chairs,—the short strut acting as a radius link. The elevation of the tongue-rail, when open, is two inches above the level of the main rails, which is found to insure the tongue-rail being properly put down upon the chairs, and closed to the main rail, and being also entirely clear from any low portions of the engines, &c.

In this construction of switches, on account of the sliding motion and friction of the tongue-rails being entirely avoided, oil is not required, and no danger can arise from sand or ashes lodging on the chairs; also, the removal of any larger fragments of coke or ballast is, to a certain extent, provided for by the altered form of the chairs, which this manner of opening the tongue-rails admits of. As the tongue-rails require no larger surface to rest upon than is actually in contact with the chairs, when they are closed to the main rail, advantage is taken of this by increasing the thickness of the chairs at the particular part upon which the rails rest, forming a raised step, which is completely covered when the tongue-rail is closed; and on the open side, the width of the tongue-rail only is exposed to the reception of rubbish,—the larger pieces thus falling off, and the smaller ones being crushed or removed by the descent of the tongue. The accomplishment of this object has been satisfactorily shown by the working of one of these switches, which has been put down in a situation where sand was constantly used for the engine-wheels, and has continued to work well, although sometimes nearly buried by the accumulation of sand.

In these switches, the ends of the tongue-rails are extended a foot beyond the sharp edge that fits against the top of the main rail; and the extended ends are curved inwards, like a check-rail end, and reduced in height 1¼ inch, to allow the wheel-flanches to pass over the top, when the tongue rail is closed to the main rail; and in any case of the tongue not being properly closed, the pressure of the wheel-flanch will tend to crush any obstructing substance upon the chairs. This action is aided by the check-rail end of the tongue on the opposite side, which in such a case will not be opened to the full extent, but

sufficiently so to guide the wheel-flanches in the proper course, and, by drawing them from the other imperfectly-closed side, prevent the wheels from taking both lines.

Some of these switches are now in constant use at the York and Newcastle stations, where they can be seen in operation.

Mr. J. A. Haswell exhibited a large working model of the new switch. Mr. J. Bourne had had one of the switches in operation at the Newcastle station for a month, and some others had been tried for about six months at the York station. These had been working very satisfactorily, and were found to have a decided advantage over the other switches in use. The others required constant oiling and attention to keep them in working order; and the oil, collecting the dust and grit, caused frequent cleaning to be necessary, to prevent risk of accident, from the switch sticking partly open. In winter, great difficulty was experienced with ordinary switches from the snow, which partially melted in the day-time, and then froze again in the evening,—causing the switch-tongue to be choked up by ice, and prevented from shutting close; and the men had to be continually using salt, to thaw the ice and keep the switches working. But these new switches were completely free from those defects, and appeared very successful in meeting the requirements of self-acting switches. No oil was used, and this effected an important saving in annual expense; and from the switch-tongues not having any sliding motion on the chairs, no inconvenience was experienced from sand and dust; and the risk of their sticking partly open was effectually prevented, as they must fall on one side or the other.

For the Journal of the Franklin Institute.

Papers on Bridge Construction. By JOHN W. MURPHY, Civ. Eng. Philadelphia, Pennsylvania.

(Continued from page 147.)

THE ARCH.—In the construction of arch bridges, some definite line is assumed for the *intrado*—and some other definite line also assumed for the *extrado*.

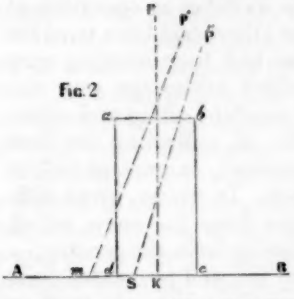
These lines are dependant upon either the taste of the engineer, or upon some necessity. In some cases it may be imperative that the *extrado* shall be a horizontal line, while the *intrado* may be any curve, according to taste. Sometimes imperative that the *intrado* shall be of that character such as will give the greatest possible area of *waterway*, at others, so that the greatest architectural effect may be produced upon the eye.

In all cases where these lines are fixed agreeably to the judgment, foresight, and discretion of the engineer, the weight of the superstructure may be approximately determined. It then only remains to give such dimensions to the *ring-stones* or *ribs*, to cut their joints in such direction as shall best satisfy the conditions of the line of *resultant pressures*.

This line requires but two conditions of satisfaction for stability, and no more.

One condition is—*That it shall be embraced or contained within the arch-stones or rib, of which the arch consists.*

The other: that it shall meet the joints of the same at a greater angle than the angle of friction of the material of which the arch is constructed.



Suppose a block of granite *a b c d*, (Fig. 2,) be seated upon a plane, A B, of the same material. Let it be acted upon by a force P, in a direction parallel to the side *a d*, and perpendicular to the plane A B. It is clear that the mass *a b c d*, will have no tendency to move, but will remain in position, unless the force P, be so great that it overcomes the cohesion of the particles of the granite, when it will crush the mass.

Suppose again, that the force P, be transferred to P′, taking the direction P′ *m*, and falling without the base of the granite block; it is clear that this force will have a tendency to overturn the block about the point *d*. And again, if it be transferred to P″, taking the direction P″ S, the body *a b c d*, will have a tendency to slide upon the plane A B, in the direction toward A, and will be resisted by the friction of the surface of the granite block upon the granite surface A B. If the angle P″ S B, be greater than the angle of friction of the material, the block will remain stationary. If less, it will move toward A. This angle in practice should never be less than 30°.

Now if we suppose that the block *a b c d*, be a portion of the *ring-stone* or rib of an arch, and that the forces P, P′, P″, are the *resultant pressures*, we readily discover the truth of the statement that this line of resultant pressure, through the supporting medium of the arch, requires but two conditions of satisfaction, and no more—and hence the point to be gained in the construction of arch bridges without counterbracing, is to so arrange the weights or masses of matter, as that this resultant line shall be as near as possible at right angles to the joints. Or finding this to be impossible, to change the direction of the joints to conform to the line; or finding this also to be impossible, make the ring parts so deep, that these two conditions may be as nearly as possible fulfilled.

If the resultant pressure upon any single section of the arch, such as *a b c d*, due to the superincumbent weight above it, take the direction as shown, either in the direction P, P′, or P″, we shall have our arch the most stable possible, when that force takes the direction P, at right angles to the joint.

Failure will take place when the resultant pressure takes the direction P′, falling entirely without the ring-stone or rib, and stability or non-stability when the force P″ makes a greater angle with that joint than 30 degrees, or thereabouts.

We now arrive at the determination of the constant value of h, in Equation (2), page 147.

Let *a b c d*, . . *g*, be the intrado of any arch, and A B C D, . . H, be the extrado. Now since it is conditioned, (by what has already been proved,) that the weight at *b* and *f*, shall have such relation to the weight at *c* and *e*, as that the horizontal thrust $= h$ shall be the same at either point.

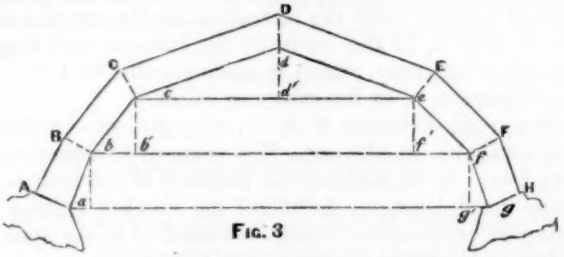
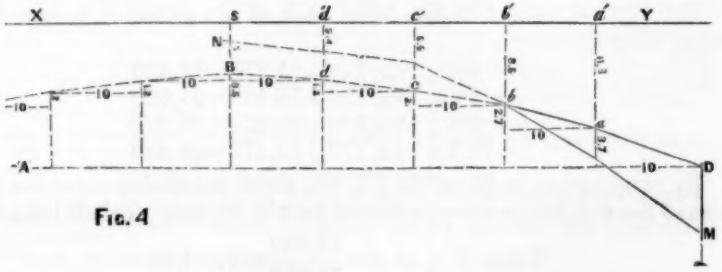


FIG. 3

It follows that the weight at the point *d*, which acts through the two braces, (so to express it), *d c* . . *d e*, shall have such a horizontal value that the points *c* and *e* shall be maintained in equilibrium by the equivalent horizontal thrust due to the value of the vertical weight at the point *c* and *e*.

In other words, suppose that the mass of matter in the stone A B, *b a*, be supposed to be concentrated at the point *b*, and in the same manner the mass of matter of *f*, F, H, *g*, be accumulated in the point *f*, and that in each instance, through the line *a b*, and *f g*.

Relieve the points *b* and *f*, from the weight of the superincumbent masses above them, and they will fall inward in the direction of the lines *b b'*, *f f'*.


X
S
d
c'
b'
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Y
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d
b
A
D
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10
10

acting at *b*, to produce *h*, is made up of *b*, *c*, *d*, and the weight acting at *c*, is made up of the weight *c*, *d*. And the weight acting at *d*, in the direction *d*, *c*, to produce *h*, is in fact,—The *horizontal component of the weight at the crown of the arch.*

Applying these principles to practice:

Suppose it be required to find the dimensions of the ring-stones of a proposed arch bridge, to be constructed in stone masonry.

It is decided that the span shall be 100 feet in the clear, and the rise (or versed line) 10 feet; the intrado to be the arc of a circle.

Let A, B, D, Fig. 4, be the curve of the intrado, and suppose X, Y, be the extrado or roadway, which is made parallel to A, D.

Let the distance B, S, at the crown = 5 feet.

From whence the distances *d' d*, . . *c' c*, &c., of the spandrel are determined, as shown in the cut. The value of *b*, Equation (2) being taken at 10 feet. If we suppose the masonry of the arch to be of the same density throughout, we shall have the weights resting upon the ring, varying directly as the dimensions marked in the spandrel.

Re-producing Equation (2) from page 147.

$$a = \frac{(\text{K}' + \text{W}' + \text{V}' \ . \ . \ . \ + \text{N}')}{h} b.$$

We have first to determine the value of *h*, putting the weight per cubic foot of our masonry at 170 lbs.

And, supposing that the weight impinging upon the crown, and acting in the direction toward the point D, shall be measured by 5 feet in height by 5 feet in length, (or $\frac{10}{2}$) also multiplied by 170 lbs., which will be sufficiently near for all practical purposes—we have $5 \times 5 \times 170 = 4250$.

$4250 : h :: 0{\cdot}6 : 10$, or $h = 70{\cdot}833$ lbs., which will be the pressure upon the ring-stone at the crown.

The vertical weight in lbs. upon each of the points *d*, *c*, *b*, *a*, will be as follows, viz:—

at $d = 5{\cdot}4 \times 10 \times 170 + 4{,}250 = 13{,}430$
" $c = 6{\cdot}6 \times 10 \times 170 + 13{,}430 = 24{,}650$
" $b = 8{\cdot}6 \times 10 \times 170 + 24{,}650 = 39{,}270$
" $a = 11{\cdot}3 \times 10 \times 170 + 39{,}270 = 58{,}480$

By substituting in Equation (2), the above calculated value for the sum of the weights as above indicated by K'+W', &c., we shall have for,

Value of a, at $d = \frac{13{,}430}{70{,}833} \times 10 = 1{\cdot}88$

" " $c = \frac{24{,}650}{70{,}833} \times 10 = 3{\cdot}48$

" " $b = \frac{39{,}270}{70{,}833} \times 10 = 5{\cdot}50$

" " $a = \frac{58{,}480}{70{,}833} \times 10 = 8{\cdot}20$

Describing the curve from a point, N, 3 feet above the line of the intrado at the crown, and passing it to M, by the data above calculated, we obtain its direction independent of the direction in which the ring-stones should be jointed, and also independent of the number of ring-stones, or rather we should say, the line has been determined upon the supposition that the joints are vertical, and that the ring-stones have a depth of ten feet. I have taken this method of progression, in order that we might arrive more clearly to the determination of these joints, and thus show by what simple changes this line is made to pass above the intrado from B, to D, and thus fulfil the requisites of stability.

(To be Continued.)

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED FROM JANUARY 18, TO FEBRUARY 15, 1859, (INCLUSIVE,) WITH EXEMPLIFICATIONS.

JANUARY 18.

136. POTATO DIGGERS; R. L. Allen, City of New York.

Claim—The arrangement and combination of the removable wings with the double mould-board. Also, the arrangement and combination of the central or dividing bar with the standard, by means of the notched fastening, as set forth.

137. RING LOCK; Wm. J. Alston, Williamson County, Tennessee.

Claim—The friction springs, arranged in combination with the inner rings of the locks.

138. APPARATUS FOR DRYING GRAIN, MALT, &c.: Stephen R. Andres, Troy, New York, and Samuel Andres and McDonough Bucklin, City of New York.

Claim—The use or employment of a blast or current of hot air introduced into the cylinder through a hollow journal, or its equivalent, when said current of hot air is brought into direct contact with the substance to be dried thereby, in combination with a cylinder made adjustable to any angle.

139. STRINGING APPARATUS; Ernst Bagniki, City of New York.

Claim—The construction of a chair containing a pump, with an arrangement of the valve chambers, in the manner specified.

140. AMALGAMATOR; John and Edward W. Barker, Baltimore, Maryland.

Claim—1st, The combination of a set of crushing or attrition rollers with an upper and lower rubber, arranged substantially as described. 2d, Introducing an independent current of water into the amalgamator, so as to flow around the lower end of the feed-pipe, and meet and mingle with the inflowing current of material. 3d, In combination with the rollers constructing the lower rubber hollow, with openings to admit the quicksilver into the interior, for the purpose set forth. 4th, Constructing the lower rubber with a vertical passage through its centre, arranged as described. 5th, The combination of the concave plate, arranged with the rollers for the purpose of directing the inflowing current to the centre, and between the rollers. 6th, Constructing recesses on the interior of the casing over the journals, arranged substantially as described.

141. SEED PLANTERS; James F. Beckwith and Adin G. Gage, South Alabama, New York.

Claim—The arrangement of the tooth, discharge spout, coverers, hoppers, frame piece, lever, and bar, substantially in the manner set forth.

142. SELF-PRIMER FOR FIRE ARMS; Wm. H. Bell, Washington City, D. C.

Claim—1st, The combination of the shield, plunger, spring, and screw-head, with the magazine chamber. 2d, The arrangement and combination of the pin on the piston, and slot in the shield, with the slot in the side of the hammer, for the purpose specified. 3d, The removable guard plate, as arranged and operated for the purposes set forth.

143. SOFA FRAME; Peter Born, City of New York.

Claim—A complete frame of a sofa made of thin layers of wood, in the manner specified.

144. COMPOSITION FOR ORNAMENTING GLASS; Jules Joseph Henri Brianchon, Paris, France.

Claim—The yellow coloring composed of resin, nitrate of uranium, essence of lavender, and the flux of bismuth; also, the orange red coloring, composed of resin, nitrate of iron, essence of lavender, and the flux of bismuth; also, the imitation gold coloring, composed of the above described orange red coloring and the yellow coloring mixed together, with additional parts of the preparation of uranium and iron; also, the variegated prismatic coloring, composed of ammoniuret or cyanuret of gold, or gold dye, turpentine, essence of lavender, the bismuth flux, and uranium; also, the mother-of-pearl coloring, composed of the bismuth flux, the flux of lead, chloride of antimony, resin, lavender, or other essence, and colophony.

145. LUBRICATING COMPOUNDS; Reuben R. Brown, Buffalo, New York.

Claim—A lubricator made of the ingredients and in the proportions set forth.

146. SEEDING MACHINES; W. G. Bulgin, West Jersey, Illinois.

Claim—The rotary coulter, leveler, with share attached, and harrow teeth, arranged relatively with respect to each other and to the seed box, provided with a suitable seed-distributing device, so as to operate substantially as set forth.

147. WIND WHEEL; Abner L. Butterfield, West Dummerston, Vermont.

Claim—Attaching the sails to the frames of the arms, so as to permit of a self-lateral adjustment of the same, and using the catches and slides with cords attached, for respectively locking the sails and freeing them from the locks or catches.

148. BELT CLASPS; George Churchill, Hartford, Connecticut.

Claim—The combination of the plates, pins, and screws, as described.

149. MODE OF OPERATING WINDOW BLINDS; John Clark, Williamsburgh, New York.

Claim—Attaching toothed flanches or pinions to the tenons of the slats, and having the flanches or pinions gear into a sliding rack bar placed in the stile of the blind, and actuated by the pinion and supplemental rack teeth, or their equivalents.

150. CANTEEN GUN STOCK; Samuel Colt, Hartford, Connecticut.

Claim—So constructing the stock of a gun that it shall constitute a canteen, as described.

151. BOOT-BLACKING APPARATUS; J. M. Connel, Newark, Ohio.

Claim—The concave-edged self-adjusting brush wheel, in combination with the spring foot-piece, constructed as described.

152. PLOUGHS; G. D. Cotton, Galesburgh, Illinois.

Claim—Combining and arranging together the beam, the standards, upright, lever, brace, bar, axle, and pole, said pole reaching forward and resting upon the neck yoke, in the manner specified.

153. CULTIVATORS; Jesse Cunningham, Marshall, Missouri.

Claim—Attaching the furrow shares to a swinging frame formed of the shaft, bar, and arm, placed in a mounted frame, in combination with the buttons provided with step-like projections for regulating or adjusting the height or inclination of said share frame, and consequently the depth of the furrows.

154. RAILROAD CHAIRS; Wm. M. C. Cushman, Albany, New York.

Claim—The buttress at each end of the outside jaw flanch or rib, in combination with the top or bearing surface, as described.

155. HORSE RAKES; L. S. Deming, Newington, Connecticut.

Claim—The combination of the fingers, shaft, or axle, cam, and lever, these several parts being constructed in the manner described.

156. SPOKE MACHINE; L. J. Dickason and John Frazee, Georgetown, Ohio.

Claim—1st, The described mode of operating the cutter frame with its cutters, and also the emery wheel and its frame, so as to throw them all clear of the spoke after the operation of twining and smoothing, that is to say, we claim the employment of the two arms upon the shaft, operated by means of a hand lever. 2d, The adjustable spring rests, when arranged in the manner set forth. 3d, The spring arm, spring catch, pitman, and bent lever, in combination with the lever, clutch, and rod, arranged so as to throw the pulley wheel in and out of gear with the shaft, in the manner set forth.

157. MACHINE FOR MAKING PRINTERS' RULES; Richard Doble and M. Angelo Starr, Richmond, Indiana.

Claim—The combination of the graduated plates, having arc-formed and radial graduations and guide bars, with their clamping screws and screw clamps arranged in relation to the saw, for the purpose set forth.

158. RAILROAD CHAIRS; Henry A. Landry, Camden, New Jersey, Assignor to R. G. Ransford, Troy, N. Y.

Claim—The improvement of a projecting piece of metal, either cast on the railroad chair or made of wrought iron or steel, and affixed and rising up alongside of the rails on railroads where two rails meet, and of sufficient height to receive all or a part of the weight of the machinery, while passing over that particular part of the rails, as described.

159. CAR COUPLINGS; Wm. Layland, Mixerville, Indiana.

Claim—The employment of the combined adjustable latch and catch, when constructed substantially as described.

160. VENTILATING REGISTERS; Joseph Leeds, Philadelphia, Pennsylvania.

Claim—In combination with a register, the hanging of a valve by its centre, so as to make said valve a regulator or cut-off to the ascending current of air, from N to M, and at the same time a regulator of the ingress or egress of air to or from an apartment, and thus causing a register to serve the purpose of a ventilator, as described.

161. MACHINE FOR BENDING UMBRELLA RIBS; Ferdinand Lehr, Hoboken, New Jersey.

Claim—1st, A reciprocating pincer, taking the wire from a fixed and drawing the same through the machine, dropping said wire, and then returning below to its previous position, so as to be out of the way of the bending or coiling of the wire into eyes or loops. 2d, Attaching said pincers and traveling carriage by one side thereof, while the power for sliding said pincers lengthwise of the machine is applied to the other jaw, whereby the clamping and releasing of the wire is effected by the act of moving said pincers. 3d, Attaching one end of said pincers on a stud or shaft, in combination with the stops, spring, and slotted connecting link, whereby the sliding, clamping, depressing, and elevating motions are given to the pincers by the reciprocations of said rod. 4th, The shear receiving the compound motion set forth from the cams, in the manner specified. 5th, The clamping levers, in combination with the ledges and shafts that press against and hold the wire while the loops are being formed. 6th, The mandrels, in combination with the turning shafts and stubs, when the said mandrels are projected from the blocks, or their equivalents, for the wire to be bent around the same, to form the loops or eyes in the spokes or ribs, and withdrawn from said eyes when the same have been bent. 7th, The arrangement of the sliding bar and the connexions therefrom to the clamping levers and slides, whereby the clamps and mandrels are simultaneously actuated. 8th, The sliding stocks carrying the shafts and turning stubs, for allowing the withdrawal of said stubs out of the way of the traveling pincers, and in combination therewith the bar and connexions therefrom to said stocks for communicating endwise motion to said stocks. 9th, The sliding mandrel and turning shaft connected, in combination with the jaws, or their equivalents, for turning the eye or loop in the end of the spoke or rib. 10th, The arrangement of the cranks and slotted connecting rods for communicating motion successively to the slides, and from the same to the turning stubs or loop formers.

162. MILK COOLERS; Jacob Mansfield, Jefferson, Wisconsin.

Claim—The portable milk cooler, when constructed in the manner set forth.

163. HEMP BRAKES; Richard Mansley, Philadelphia, Pennsylvania.

Claim—Operating the slide with its transverse bars by the cam, arm, and spring, when arranged substantially as described, and when the said spring is so graduated that the slide shall instantly recede after reaching the limit of its outward movement.

164. MACHINERY FOR TARRING OAKUM; Richard Mansley, Philadelphia, Pennsylvania.

Claim—The perforated vessel, or its equivalent, placed within a stationary vessel, which contains the compound for tarring oakum, a jet of steam being admitted to the stationary vessel, while a reciprocating motion is imparted to the perforated vessel.

165. HORSE SHOE MACHINE; B. A. Mason, Newport, Rhode Island.

Claim—The combination of the four hammers, arranged in pairs, the two constituting each pair being mounted to strike simultaneously and in opposite directions, and the two pairs working at right angles with each other, or nearly so. Also, the employment of an elastic bush in the connexion of the hammers with the cranks, by which they are operated.

166. HOLDERS FOR LAMPS; Charles Monson, New Haven, Connecticut.

Claim—The mode or means of counterbalancing the system of levers or lazy tongs, or the same and one or more articles suspended from or supported by them, and this, whether the counterbalance weight be applied, so as to push or pull on the levers of the lazy tongs. Also, the method of steadying the tube or rod, or its equivalent, suspended or extending from the lower termination of the system of crossed levers or lazy tongs, viz: by the collar or slide, the levers, and the connexions, applied to the part, and the lazy tongs, and made to operate essentially, as specified.

167. CONSTRUCTING A COMBINED STREET-PAVEMENT RAILROAD TRACK; Richard Montgomery, City of New York.

Claim—A combined street-pavement and railroad track, constructed substantially as described.

168. REVOLVING FIRE ARMS; Henry S. North, Middletown, and Edward Savage, Cromwell, Connecticut.

Claim—1st, The employment of the movable cylindrical bushing-rings or thimbles, applied substantially as described, within cavities formed in the front portions of the chambers of a rotating chambered-breech, which has a longitudinal movement to operate and be operated upon, in combination with a valve-like seat, which is formed upon the rear of the barrel. 2d, The combination of the slide working in the bottom of the cylinder frame, and the double-jointed trigger-guard, part of which constitutes, also, a part of the lever, through whose agency the rotation of the cylinder and cocking of the hammer are effected.

169. WASHBOARD; John K. O'Neal, Kingston, New York.

Claim—The flexible rubber combined with the washboard, so that its upward movement shall be assisted by a spring, or its equivalent.

170. COLORING AND CURING TOBACCO-STEMS; Benjamin Payn, Albany, New York.

Claim—Coloring and curing tobacco-stems at one operation, by subjecting them to the action of steam.

171. CLOTHES SPRINKLER; Thomas Payne, Ridgefield, Connecticut.

Claim—A clothes sprinkler having an interior self-closing stopper, and made in the manner set forth.

172. FURNACES; Samuel Pierce, Troy, New York.

Claim—The series of detachable or removable heat-radiating plates constructed with points or stems, projecting from their surfaces, both of the surfaces being radiating surfaces, in the manner described. Also, in combination with a horizontal fire-box and fire-chamber, and the outer casing, a series of plain heat-radiating plates, or a series of corrugated heat-radiating plates.

173. CARPET-SWEEPER; Samuel F. Pratt, Roxbury, Massachusetts.

Claim—In combination with the case and the rotary brush of a carpet-sweeper, a serrated or toothed clearer applied so as to cleanse the brush, during and by its revolutions. Also, the arrangement of serrated or toothed clearers on opposite sides of the brush, in order that it may be cleansed while being rotated in either direction. Also, the arrangement of the serrated clearer in the case of the carpet-sweeper, in such manner that the said clearer shall form part of, or be maintained by, the dust receptacle. I do not claim the application of a single elastic-tired driving-wheel to the driving-wheel affixed on the brush-shaft; but claim the arrangement of two of the elastic-tired wheels on opposite sides of the driving-wheel of the brush-shaft, as described, and so applying the said shaft in the case and to the fork of the handle, as to enable the brush-wheel to be forced in close contact with its drivers, not only when the machine is moved in either direction, but by the force exerted through the handle, and to so move the machine, the same insuring the rotary motion of the brush, whenever the machine may be in the act of being moved on and over a carpet.

174. MODE OF ATTACHING THILLS TO VEHICLES, &c.; R. P. Brindle, Coventry, New York.

Claim—The flanch on the bolt or pin, so made and inserted that it cannot be removed when the joint is varied from the position in which the bolt is introduced.

175. COUPLING GUN STOCKS WITH PISTOLS; Samuel Colt, Hartford, Connecticut.

Claim—The neck piece with its projecting end passing under shoulders in the lock frame, in combination with the holder pins and clamping bar, arranged as described.

176. FILE HANDLES; Wm. W. Draper, Greenfield, Massachusetts.

Claim—The centralizing socket or socket piece and spring, in combination with the handle and the fastening jaws and their operative mechanism, applied within the said handle.

177. BATHING APPARATUS; Charles Escudier, Pattersonville, Louisiana.

Claim—The application in bathing apparatus of two boilers and steam pipe connected thereto, affording, when united, an apparatus for the application of whatever kind of bath that may be desired.

178. OX YOKES; James D. Foster, Montgomery, Alabama.

Claim—Constructing the bows of four parts, a a, b b′, the parts, a a, being permanently attached to the stock, and the parts, b b′, attached by hinge joints to the parts, a a, and provided with a fastening, substantially as set forth.

179. MACHINERY FOR MOVING RAILROAD CARS ON RAILWAYS; Ambrose Foster and Harvey Brown, City of New York.

Claim—1st, The rope supporter, constructed in the manner set forth. 2d, The sliding rods with the coiled

springs attached, or their equivalent. 3d, The grab or catch, constructed in the manner and for the purposes set forth.

180. VEGETABLE CUTTER; J. Fraser, Rochester, New York.

Claim—The combination of the eccentric rod, arranged as described, with the pivoted or adjustable bed which bears the knife.

181. CATTLE PUMP; Hugh Gerred, Sparta, Illinois.

Claim—The arrangement and combination of the guides and bucket, the latter having a valve, clasp, and spring, the trough, platform, and wheels, as described.

182. STEAM VALVE; Henry Goulding, San Francisco, California.

Claim—1st, Supplying the working cylinder of the engine or machine at each successive stroke with its impelling gas or vapor from reservoirs previously charged therewith, and under the control of a valve or valves, the same serving as a substitute for a cut-off to work the gas expansively. 2d, Operating a valve in part or in whole by the gas or steam, at full pressure, from the supply pipe acting to propel it in the one direction, when the same is used in concert with an opposing force to the valve, produced by the expansion of the gas in its passage to or performance of its work. 3d, The combination of the valve and valve cylinder or case with its reservoirs, and the several inlets or outlets for action together, in the manner described, and whereby the one valve is made to govern the ingress and egress of the gas to or from the reservoirs, as well as to control the inlet and exhaust of the working cylinder.

183. CORN PLANTERS; James Hughes and Nathan Stoneleiper, Cambridge, Maryland.

Claim—The detached arrangements of the gravitating trigger, connecting rods, perforated slide, hoppers, and scorer, operating as described, to deposit seed at each pressure and relaxation of the thumb of the driver.

184. HEATING APPARATUS; Rensselaer D. Granger, Philadelphia, Pennsylvania; ante-dated Nov. 24, 1858.

Claim—Combining the air chamber with the separate perforated chamber, having an independent communication with the air, so that the said perforated chamber may serve the double purposes of consuming the gases arising from the ignited fuel, and of preventing the rapid destruction of the bottom of the chamber by the action of the fire.

185. COAL STOVES; R. D. Granger, Philadelphia, Pennsylvania; ante-dated Nov. 24, 1858.

Claim—Hanging within the stove and immediately above the fire, a perforated chamber, when so constructed and arranged that the air shall have free access to the interior of said chamber, and when the latter shall admit of being readily raised and lowered, or its position in regard to the fire otherwise altered.

186. FISH TRAP; Robert Gray, Anson, Maine.

Claim—The strainer, the vibrating slats, and the V-shaped chambers, in the manner specified.

187. FASTENING FOR BREASTPINS, &c.; Benjamin F. Grinnell, City of New York.

Claim—The permanent hook and spring, in combination with the hinged pin of a breastpin, or other article of jewelry, when the spring is so bent as to direct the pin, when the latter is depressed, into the hollow of the hook, and when the spring and hook are otherwise arranged in respect to each other.

188. HOUSE VENTILATION; John H. Griscom, City of New York.

Claim—The employment of an auxiliary flue or tube, connecting the hot air flue with the ventilating flue, in the manner proposed.

189. COTTON CULTIVATORS; John M. Hall, Warrentown, Georgia.

Claim—In combination with the series of adjustable revolving hoes, the scrapers, in advance of them, substantially as described.

190. APPARATUS FOR EVAPORATING SACCHARINE JUICES; Lyman P. Harris, Mansfield, Ohio.

Claim—1st, The stationary yet portable fire-place, with the stops and the springs. 2d, The portable, movable, and inclined furnace, and its combination with the stationary fire-place. 3d, The handles and their springs, and their combination with the springs; also, the rod, or its equivalent. 4th, The racks and their combination; also, the movable flue or plate and its rod, and their combination with the movable furnace and stationary fire-place. 5th, I do not claim the heater, nor evaporator, as my invention—but I claim, as an improvement, the application of one or more strainers and valves to the heater and evaporator.

191. COFFEE ROASTERS; Theodore Heerman, Mitchelsville, Tennessee.

Claim—1st, The specified arrangement of the plates or shelves, for the purposes set forth. 2d, The combination of a window or windows in one or both ends of a coffee-roaster, with the inclined elevating plates or shelves.

192. CORN PLANTERS; John L. Hoag, Geneva, Illinois.

Claim—The arrangement and combination of the arm, lever, K, and bar, said lever serving as an oblique brace to hold the bar. Also, the arrangement and combination of the lever, slide, lever (j), upright, bar, and swinging frames, as described.

193. REVOLVING HARROWS; Mark W. House, Cleveland, Ohio.

Claim—The combination with the spindle of a revolving harrow, of the cap and box, for the purpose described.

194. CATTLE PUMPS; John H. Irwin, Carlenville, Illinois.

Claim—The platforms, weight, drum, and pulley, placed loosely on drum, and connecting with it by the pawl and ratchet, the whole being combined as set forth.

195. COMPOSITION FOR LINING METAL PIPES; Wm. Johnson and Hugh Forbes, Brooklyn, New York.

Claim—The composition of matter, substantially as set forth, for lining metallic, or other pipes or surfaces of a similar kind.

196. HARVESTERS; Wm. F. Ketchum, Buffalo, New York.

Claim—The combination of the openings in the guard-tooth below the cutters with the caps above the cutters, as described.

197. ROLLING AND PRESSING WOOL; Wm. W. Purdy, Liverpool, Ohio.

Claim—The combination of the sectional rollers with the strap and breast-piece, for the purpose of rolling and pressing fleeces of wool, as described.

198. TRUSS SPRINGS; J. W. Riggs, City of New York.

Claim—Constructing springs for trusses, in the manner set forth.

199. METHOD OF PACKING CARTRIDGES; E. K. Root, Hartford, Connecticut.

Claim—Putting up cartridges between two blocks, or their equivalents, as described. Also, forming in the package or holder a receptacle or receptacles for containing caps or other primings, as described.

200. SEEDING MACHINES; John F. Seaman, Clyde, New York.

Claim—Operating the seed-distributing device by means of the part of the handle attached by a pivot to the other part of said handle, and connected at its lower end to the shaft by a cord or chain, the above parts being used in connexion with the spring attached directly to the other handle of the implement, and to the shaft, by a cord or chain, the whole being arranged as set forth.

201. HORSE-SHOE MACHINE; Solomon Shetter, Allegheny, Pennsylvania.

Claim—1st, The curved arms of clamps, moved and operated by the friction rollers, and the backward and forward movements of the table, when the clamps are used in connexion with the dies, as described. 2d, The use of the flexible strip, for the purpose of operating the clearer, as described 3d, The arrangement on the upper surface of table, of dies, springs, the under jaw of the shears, and the clearer, when used and operated in connexion with the clamps, friction rollers, roll, shear, and swage, as described.

202. SWEEPING MACHINE; Stephen Wm. Smith, Brooklyn, New York.

Claim—1st, The combination of the gears with the driving-wheel, constructed as described. 2d, The method of adjusting the brush by the plate, which admits of both vertical and lateral adjustment. 3d, Preventing the escape and rising of the dust by means of the flexible curtain.

203. MANUFACTURE OF WHITE LEAD; Benjamin F. Smith, City of New York.

Claim—The manner of filling the chamber with metallic lead, by means of the open work tables or racks in which the lead in detached pieces rests, arranged one above the other in successive and close series, and whereby a more thorough and equal circulation of the fumes or gases amongst the lead is produced. Also, constructing the converting chamber with an inclined bottom. Also, the method described of extracting from the converting chamber the carbonate of lead, and other incidental products, by means of a current or currents of water passing through said chamber from top and bottom. Also, subjecting the carbonate of lead, and other incidental products, previous to their extraction from the converting chamber, to the action of steam, substantially in the manner specified.

204. INSTRUMENT FOR TURNING THE LEAVES OF MUSIC BOOKS, &c.; C. B. Thayer, Boston, Assignor to self and Charles Robinson, Cambridgeport, Massachusetts.

Claim—The double holding cords, elastic springing cords, or their equivalents, back or catch band, provided with clamps, and notch, and the curved eccentric rod or way, operating in connexion with, and in relation to, each other, in the manner specified. Also, the escapement catch, operating in connexion with the curved rod and thimbles of the holding cords, as described.

205. HORSE POWER; Ferdinand M. Sofge, Columbus, Georgia.

Claim—The combination of the cogged wheel, having the supporting flanch and the wheel, with corresponding cogs and bearing, revolving upon the supporting ring.

206. COOKING STOVES; P. P. Stewart, Troy, New York.

Claim—In combination with a stove, such as described, making the front plate of the oven open with doors, and an apron to receive and hold a tin kitchen or roaster, that the heat radiated by the front plate of the fire chamber may be aided by the heat radiated by all the oven plates when combined with an end door, whereby the draft may be controlled without the aid and independent of the front doors. Also, the boiler having a removable cover and two inclined flues, which are separate at the lower end, united into one at top to connect with the chimney, in arrangement with the exit flue space, to which the boiler is fitted, and into which the gaseous products of combustion are discharged from the series of direct and return flues, substantially as specified.

207. DEVICES FOR GATHERING GRAIN INTO GAVELS; W. M. Waggoner, Middletown, Indiana.

Claim—The stationary fingers and the fly or gathering fingers attached to a suitable framing or stanchions, mounted on wheels, as set forth.

208. DEVICES FOR REEFING SAILS; Louis B. Wakeman, Baltimore, Maryland.

Claim—The employment of the smooth-surfaced clamp, as described, when in combination with the forked screw-bolt, or its equivalent, carrying the blocks through which the rolling halyards pass, for the purposes set forth. Also, giving direction to windlass ropes by the bent arm, when in combination with the clamp and forked screw-bolt, when fitted with an ordinary block, operating in the manner set forth.

209. HARVESTERS; Wm. M. and Andrew Whitely Springfield, Ohio.

Claim—A finger so constructed that the slot or opening above the cutters shall increase in capacity from front to rear, in combination with the clearing projection described, passing directly into the rear corner of said opening, in the manner described. Also, forming the clearing projections of a bent extension of the cutter, as described.

210. RAILROAD CHAIRS; John Young, West Galway, New York.

Claim—The combination of bearing surfaces capable of forming any desired angle with each other, and the securing portion of the chair, substantially as set forth.

211. GRAIN-FAN AND CORN SHELLER; Humilton E. Smith, Philadelphia, Pennsylvania, Assignor to self, D. B. Nelson, Cortland Co., and John L. Myers, Chemung Co, New York.

Claim—Arranging the spiked roller and slotted shield of a corn sheller on the frame of a grain-fan, in respect to, and in combination with, the sieve frame, blower, and inclined plane of the said grain-fan, in the manner described, so that the said blower, sieve frame, and inclined plane, may serve the purpose of separating the cobs from the shelled kernels of corn, and the latter from the chaff, and other refuse.

212. MANUFACTURE OF STEEL; Frantz Anton Lohage, Unna, Prussia, Assignor to Edmund Leopold Bewzon, Boston, Massachusetts; patented in England, January 29, 1850.

Claim—Regulating the heat and stopping the decarbonization of the fused mass of metal in the finishing process in the puddling or reverberatory furnace, before it becomes converted into malleable or wrought iron, and whereby I obtain steel in the manner specified.

213. PADDLE WHEEL; Nelson Orcutt, Assignor to self and G. W. Gregory, Binghampton, New York.

Claim—The centrally suspended paddle or bucket without any stop, means, difference of area or of weight,

for holding it in a working position, but left entirely to the action of the forces exerted upon it during the revolution of the wheel, as set forth.

214. UMBRELLA FRAMES; Joseph Bloom, Assignor to R. E. Rogers, Philadelphia, Pennsylvania.

Claim—The bow or rib, constructed substantially as described. I am aware that the bow or rib, and the brace or sustaining rod, have been attached to collars upon the standard by a piece of metal having an enlarged end affixed to the end of the bow or rib, and a like piece of metal affixed to the end of the brace; the enlarged end fitting into a slit of a sheet metal collar, the flanch of which must be swaged down upon the enlarged end, in order to hold it in place; and I therefore do not claim this method—but I claim connecting the bow or rib and the brace or sustaining rod to the collars upon the stem or standards, by the means set forth. I am also aware that the end of the brace or sustaining rod has been connected to the bow or rib, by the end of the brace being riveted to a band, which may be sprung into a groove in the inner surface of the bow or rib, and I therefore do not claim this method of connecting the two parts here named—but I claim connecting the brace or sustaining rod to the bow or rib by the spring board embracing the bow, as set forth.

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215. TREATMENT OF FATTY ACIDS; J. C. Appenzeller, Cincinnati, Ohio.

Claim—After subjecting the mixture for a time to the direct action of steam, shutting off the steam from it, and raising its temperature by the application of heat to the exterior of the vessel.

216. VALVES FOR STEAM ENGINES; Robert Bailey, Troy, New York.

Claim—The arrangement and combination of the tubular valve, seat, induction pipe, eduction valve, levers, and cams, as described.

[The puppet valves of a steam engine are, in this invention, constructed with hollow tubular stems fitting with stuffing boxes directly to the induction and eduction pipes of the engine, and making communication directly through their interiors and around the exteriors of their seats between the pipes and the cylinder, thus very simply making them balanced valves.]

217. CAR SEATS AND COUCHES; W. M. Baker, Walpole, Indiana.

Claim—1st, The arrangement and combination of the boards, arms, curved bar, legs, fenders, slide, seat, and rods, as described. 2d, The arrangement and combination of the curtain, H, the seat backs, drums, weights, curtains, U, and rod, so that when the rod descends, the curtains, U, will fall, and the curtain, H, rise, and when the rod is released, all the curtains will be simultaneously rolled up.

218. BRICK MACHINE; Gerard Bancker, City of New York.

Claim—1st, The combination of the adjustable plunger with the side rods and rods of the rotating mould box, for operating the compressors, in the manner described. 2d, The use of the cleat, in combination with the rotating moulding box and semicircular stationary cap plate, as described. 3d, The use of an elevator plunger, operating in combination with the rectangular rotating mould box, adjustable compressors, and cap plate, as a device for moulding and compressing clay into bricks, and discharging the same therefrom.

219. APPARATUS FOR DISPLAYING STEREOSCOPIC PICTURES; Joseph Beckel, City of New York.

Claim—1st, In combination with an endless chain of pictures, the revolving prism, arranged and operating as described. 2d, The rest or stop. 3d, The concave. 4th, The pads or cushions, arranged and operating as specified.

220. WIND WHEELS; W. H. Benson, Wetumpka, Alabama.

Claim—Constructing a wind wheel of a series of strips or slats placed centrally on a shaft, spread, and overlapped, and secured together and to the shaft, as described.

221. SODA WATER APPARATUS; Edmund Bigelow, Springfield, Massachusetts.

Claim—The arrangement of a set of syrup cans, ice chamber, and draft pipe. Also, the combination of a measuring faucet with the described arrangement of devices for drawing the syrups and soda water.

222. MACHINERY FOR FORMING HAT BODIES; Seth Boyden, Newark, New Jersey.

Claim—Conveying the fur from the picker to the perforated cone, by means of jets of steam issuing from the tubes, arranged relatively with the picker and cone, as described.

223. LOUNGE; John G. Broemser, St. Louis, Missouri.

Claim—The described arrangement of the spring catch and the serrated arc, in combination with the pawl which gears into ratchet teeth at the lower edge of the hinges, and which is attached to a rocking crossbar, and connected to the catch. Also, the valve in the seat which is operated by an arbor, and by means of a cam and a hook, in combination with the sliding frame.

224. BOOT-JACK; Wm. W. Cansler, Baltimore, Maryland.

Claim—The metal folding boot-jack, described, with pointed prongs and pointed end.

225. MOLE PLOUGH; Jarvis Case, Bloomington, Illinois.

Claim—1st, So suspending the mole to the beam or coulter as that it cannot go vertically beyond a given depth, whilst it may move laterally. 2d, Extending the nose of the mole into the rear of the coulter, so that it cannot at any time run out of the line of cut of said coulter at its point.

226. FIELD FENCE; Seth Cheney, Riantone, New York.

Claim—The particular construction of panels, and its combination with the rails, in the manner set forth.

227. LAMPS; Samuel Cheney, Cleveland, Ohio.

Claim—The gas tube and openings, in combination with the wick tube and cap, when constructed as described.

228. AMALGAMATOR; Augustus M. Church, Augusta, Georgia.

Claim—The arrangement described of the vibrating riffles of the inclined trough, by which it is proposed to save the finest particles of the gold by amalgamation.

229. METHOD OF HANGING RECIPROCATING SAWS; John C. Cline, Philadelphia, Pennsylvania.

Claim—The employment of a spring either straight or spiral to suspend the fulcrum of pitman bars, or other reciprocating levers, in the manner set forth.

230. PORTABLE BEDSTEAD; Francis Cotton, Brooklyn, New York.

Claim—The arrangement of the stand rails, straps, and end supports, forming an improved portable bedstead.

231. PAPER RAG ENGINES; Isaac N. Crehore, Boston, and Francis Stiles, Jr., Leicester, Massachusetts.

Claim—A bed-plate composed of sheet metal knives, corrugated or formed with a series of angles or curved lines through their entire length, in the manner described.

232. RAILROAD CHAIRS; D. W. Crocker, Deposit, New York.

Claim—The arrangement and combination of the inclined grooves, key, jaws, and rail, so that the weight of the cars will depress the base parts of the chair, and thereby cause the jaw parts to gripe the rail more firmly.

233. FIELD FENCE; Daniel S. Curtiss, Madison, Wisconsin.

Claim—The mode of notching the ends of the rails, and keying together the ends of the panels, in the manner set forth.

234. CORN HUSKERS; Abbot R. Davis, East Cambridge, Massachusetts.

Claim—The combination of the rolls, spring board, slotted projection, and conical projection, when constructed in the manner described.

235. SUGAR CANE MILLS; Wm. T. Dennis, Richmond, Indiana.

Claim—The plating or covering of the iron roller of sugar cane mills with tin, or other anti-corrosive metal or substance.

236. CONSTRUCTION OF POSTS FOR FIELD FENCES; John Drown, Huron, New York.

Claim—The arrangement of the braces, one fixed and the other hinged or pivoted thereto, in combination with the rails and chair, as specified.

237. HYDRAULIC PRESS; Richard Dudgeon, City of New York.

Claim—The described hydraulic press consisting of the injection piston, chambers, and ram, constructed as set forth.

238. SHOE HORNS; Daniel E. Eaton, Boston, Massachusetts.

Claim—The improved shoe horn, as made with a heel guide and nipper jaw applied to two crossed levers and so as to operate together as specified.

239. IRON BRIDGES; Lewis Eikenberry, Easton, Pennsylvania.

Claim—1st, Having the uprights and diagonals of the side formings of the bridge so united together that they shall be capable of turning on their points of connexion, and thus, whenever expansion or contraction in the metal occurs, they may be able to compensate therefor without ceasing to brace the bridge at top and bottom. 2d, The combination of lattice side frames of bridges, formed of diagonal braces and angle iron uprights, which are united together, so as to turn on their points of connexion with tubular, semi-tubular, or angle iron arches, as set forth.

240. COFFEE POTS; W. H. Elliot, Plattsburgh, New York.

Claim—1st, The combination of boiler, stillworm condenser, conducting or discharge tube, the external opening of the stillworm at g, when these devices are so arranged in relation to each other that an opening to the external air shall be provided for the non-condensible gases, while the condensible vapors are reduced to a liquid without coming in contact with the condenser water, and then turned by conductors into the boiler. 2d, The arrangement of the joint below the spout, so that no vapor can pass through the spout without first passing the joint. 3d, The employment of conductors in combination with the condenser, for the purpose of filling the water-joint or keeping it full.

241. TANNING; Lewis C. England, Owego, New York.

Claim—1st, Applying the liquor to the bark while said bark is being discharged from the mill, for the two-fold purpose of making it a conveyor of the same, and a preserver of the dust thereof. 2d, The method of applying the heated liquor to the bark, for the purposes and in the manner set forth.

242. THRESHING MACHINES; John B. Ford, Addison Sullivan, and Albert Gregg, New Albany, Indiana.

Claim—The combination of the cutting cylinders, A A, provided with knives, the cylinder, C, and concave, B, provided with teeth, screens, and the fan, in the manner specified.

243. SEWING MACHINES; Wm. A. Fosket and Elliot Savage, Meriden, Connecticut.

Claim—The feeding device, so operating as to cause the cloth to progress by grasping the same with a positive force, in contradistinction to the employment of spring pressure between two surfaces moving in unison while feeding. Also, setting the shank of the revolving and reciprocating looping hook at an angle to the bed-plate, for the purpose of avoiding motion of the said hook in the direction of the axis of revolution. Also, operating the slide plate from above the sewing table by means of a feed-foot having two motions, one vibratory in the line of feed, the other reciprocatory and perpendicular to the table, or thereabouts.

244. SMUT MILLS; Carl Frank, Cleveland, Ohio.

Claim—Arranging between the trough containing the grain to be scoured and the scouring cylinder, a slotted hollow cylinder, revolving within another hollow cylinder.

245. HORSE POWERS; John Frazer, Newberry, Pennsylvania.

Claim—The combination of the flanch upon the end of the sweep shaft, with the groove in the collar, or its equivalent, for securing the shaft against the longitudinal motion, in connexion with the wheel and pinion attached to the sweep shaft, and the stationary wheel and pinion which keep the shaft in a directly radial position.

246. COMBINED CHAIR AND LOUNGE; F. J. Gardner, Washington, North Carolina.

Claim—The seat, back, and supplemental back, connected together by joints, and provided respectively with the legs, arms, and rockers, as set forth.

247. LANTERNS; Conrad Gersten, Brooklyn, New York.

Claim—The mode of controlling the currents of air which feed the flame, by taking the air from the top of the lantern and causing it to pass down in a narrow annular passage to the apertures leading to the burner, in combination with the deflector which encloses the burner chamber. Also, in combination with a lantern in which the flame is protected against disturbing causes outside, the arrangement for controlling the wick

from outside the lantern. Also, combining with the burner and the oil reservoir, and interposed between the two, an air chamber for preventing the oil from being overheated, as described.

248. BORING MACHINE; E. A. Goodes, Philadelphia, Pennsylvania.

Claim—1st, The adjustable worm attached to its shaft, and arranged as set forth. 2d, The gauge plate attached to the bow, in connexion with the index on the mandrel, for the purpose specified. 3d, The arrangement of the tube on the shaft, pinion, *l'*, on said shaft, the pulley on the the tube, and also the pinion, *i*, and the rack on the mandrel, as set forth.

249. HEMP BRAKES; John Hindman, Haynesville, Missouri.

Claim—The reciprocating beater, stationary bar, and reel, combined and arranged as set forth.

250. SCREW PROPELLER; Augustus Jouan, San Francisco, California.

Claim—Combining with the rigid blades of a propeller, an elastic blade, as described.

251. MACHINE FOR SAWING WINDING FORMS; John C. Hitz, Cincinnati, Ohio.

Claim—1st, In combination with one or more shifting supports or rests, the rocking bench, suspended at or near its windwith by journals, and provided with suitable feeding and canting mechanism. 2d, In connexion with a carriage and crane, and with a rocking bench, having the described or equivalent feeding or canting mechanism, the vibratory and arched rest, armed with spikes. 3d, In combination with a rocking rest and spheroidal feed roller, the pointer, adjustable in height and having automatic retrograde motion, so as to indicate on the top of the slab the relative position of the bottom of the kerf. 4th, In combination with the rocking bench, the prying lever, constructed as set forth.

252. METHOD OF EXTRACTING OIL FROM COAL; E. N. Horner, New Brighton, Pennsylvania.

Claim—The use of a mixture of cream of tarter, common salt, and slaked lime, for the purpose of condensing the oleaginous vapor produced by the dry distillation of coal, shale, or other bituminous minerals, extracting the oil from the gas and depriving the gas of its inflammable quality, and throwing off the sulphurous vapor, in the manner specified.

253. WASHING MACHINE; Benjamin Illingsworth, Freeport, Illinois.

Claim—A washing machine, having a tilting box, cylinder, spring rollers, and otherwise constructed as described.

254. LAMPS; Richard Jenkins, Covington, Kentucky.

Claim—The combination of the inner and outer cones, when arranged in relation to the wick tube and each other, as specified, and supplied with air or oxygen, for the purpose of maintaining a perfect combustion of the heavier gases or matter arising, by capillary attraction, in the space or chamber existing between the cones, and thus producing, with coal oil, a brilliant flame, with very little, if any, blue appearance at its base above the outer cone.

255. MACHINES FOR MAKING CLAY PIPES; John Jones, Baltimore, Maryland.

Claim—A two-sized permanent core or mandrel, in combination with the fixed die and adjustable jaws, constructed in the manner described.

256. APPARATUS FOR EVAPORATING SUGAR JUICE; Augustus Jouan, San Francisco, California.

Claim—The floating cover applied to the evaporation of saccharine liquids, or for concentrating heat for other purposes, constructed as set forth.

257. METHOD OF BLOWING-OFF STEAM BOILERS; James H. Washington, Baltimore, Maryland.

Claim—Connecting the pipe, c, by an elastic or yielding joint to the stationary pipe, and furnishing its opposite end with a float that will keep the inlet into said pipe, c, at or a little below the surface of the water in the boiler, so as to blow off sediment, &c., at the surface, however much it may rise or fall, or vary.

258. FURNACES FOR DISTILLING ZINC; Samuel Wetherill, Bethlehem, Pennsylvania.

Claim—The employment of vertical retorts with movable caps at top and movable cups at bottom, in combination with the fire chamber of a furnace, and suitable chambers for the circulation of heat, when applied to the reduction of ores of zinc to the metallic state. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the mode of mounting the vertical retorts, by having them sustained by their lower ends resting in suitable sockets, and unconfined at their upper ends, whereby they are free to yield to unequal expansion. Also, in combination with retorts for the reduction of the ores of zinc to the metallic state, the employment of two fires with separated ash-pits, whereby the fires can be separately cleansed and stocked, to admit of applying a continuous heat to the retorts. Also, in combination with vertical retorts for the reduction of the ores of zinc to the metallic state, the employment of perforated central tubes, for the discharge of the metallic vapors from the charge, and the condensation thereof to the metallic state. Also, the combination of the vertical retorts, the perforated central tubes, and the movable cups and appendages at the bottom, and the movable caps at the top, all concurring in the more ready changing of the retorts, the working of the charge, the escape and condensation of the metallic vapor to the metallic state, and the delivery thereof, and the discharge of the residuum from the retorts, and the re-charging of them.

259. BOAT FOR TRANSPORTING RAILROAD CARS; Jesse Wheelock, Lancaster, New York.

Claim—1st, The arrangement of the ropes or chains, pulleys, and timbers, when applied to each end of the boat, for the purpose of holding the boat steady at the bow and stern while the cars are being transferred to or from the boat. 2d, The arrangement of the bumper dock relatively to the dock and slip, for the purpose of arresting the headway of the boat, and allowing it to be drawn sidewise into the slip, so that the track which runs lengthwise of the boat may be brought into line with the suspended track. 3d, The combination of the suspended track with or without the short portion, with the track on the boat, for the purpose of conveniently transferring the cars to or from the boat, at whatever height the boat may stand in the water.

260. HEATING APPARATUS; George W. Williamson, Scranton, Pennsylvania.

Claim—The application to fire chambers or smoke flues of a double series of plates, when the same are constructed in the manner set forth.

261. ROTARY PUMP; George Wingate, Philadelphia, Pennsylvania.

Claim—The revolving bucket wheel with any suitable number of pistons, operated by the cam, in combination with the exterior casing, its chambers, and partitions.

262. WASHING MACHINE; George W. Wilson and Andrew Johnson, Walnut Grove, Illinois.

Claim—A washing machine, having upon the central cylinder a plate, arms, curved slats, and rod, for securing the clothes, and in the upper part of the cover a rubbing device consisting of a slat, with slats or corrugations at its sides and rollers.

263. VALVE GEAR OF OSCILLATING STEAM ENGINES; Herman Winter, City of New York.

Claim—1st, The method of causing a shaft by means of which the valves of an engine are moved to revolve through the agency of a cam, a lever, and a crank, and the oscillation of the cylinder to which the shaft is attached. 2d, The combination of a toe keyed to some rod which actuates a valve or valves, with an adjustable swinging toe and a revolving cam, as set forth.

264. WASHING MACHINE; George L. Witsil, Wilmington, Delaware.

Claim—The combination of the corrugated or fluted conical cylinder, placed vertically with the corrugated or fluted sides of the conical tube, as described.

265. PROCESS FOR DECOMPOSING FATS; Robert A. Wright and Louis J. Fouche, Paris, France.

Claim—Producing a continuous automatic circulation of highly heated water in a very finely described state through the bodies under treatment, by means of an apparatus constructed as described.

266. BOOT-JACK; Wm. D. Young, Baltimore, Maryland.

Claim—The construction of a boot-jack, when used in combination with a chair, as described.

267. CLOTHES FRAME; Daniel C. Colby, Keene, Assignor to self and Daniel W. Ransom, Croydon, N. H.

Claim—The arrangement of the levers, in combination with the pawl and the shaft, operating as set forth.

268. DRAWING FRAMES FOR FIBROUS MATERIALS; Silas C. Durgin, Holyoke, Massachusetts, Assignor to self and Ammon R. Durgin, Nashua, New Hampshire.

Claim—The arrangement of the conical draft rollers between the gauge trumpet and the other reducing rollers, and supporting such trumpet by a mechanism, which will enable the said trumpet to operate both as a gauge to the sliver and to guide it to the rollers, and to be vibrated with regard to the conical rollers. Also, the combination of mechanism for supporting and vibrating the trumpet, the same consisting of the bent lever, the overbalance carrying lever, and the stationary stud. Also, the arrangement of the supporting arm, of the weight above the fulcrum of the lever, to operate with reference to the lateral drag of the sliver on the trumpet, as described.

269. KNITTING MACHINES; Jonathan Filler and Joseph Bullock, Cohoes, Assignors to Wm. Smith, Albany, New York.

Claim—The apparatus attached to the stop carriage, viz: the combination of the slides, parol, gauge, and arm, operating together upon the breaking of the fabric to uncouple the driving powers by and in combination with the ring, pin, and spring, which release the detent.

270. TELEGRAPHIC MACHINES; David E. Hughes, Assignor to the American Telegraph Company, City of New York.

Claim—1st, Giving to the key, while still pressed by the operator, a second motion at the instant that the circuit is closed or broken, as the case may be, so that an indication of said closing or breaking will be given to the operator. 2d, The method for governing the position of the letters upon the type-wheel with respect to that of the platen or roller over which the paper travels, in order to insure an exact position of any particular letter at the moment of printing the same, viz: by so advancing or retarding the said type-wheel upon its shaft, whenever it has lost or gained in time in regard to the travel of the circuit breaker at the distant station, that the letter indicated will be certain to stand directly over the said platen at the movement the latter brings the platen into contact with said letters. 3d, Effecting the printing of each letter without arresting the motion of the type-wheel, by causing the platen to revolve in the same direction and with the same speed as the type-wheel, while said platen is bringing up and holding the paper in contact, whereby the paper is advanced along with the type or letter from which it is receiving an impression. 4th, The devices by which the type-wheel is started from its zero by an operator at a distant station, consisting of the shaft, set in motion by the electric current, and acting in combination with the clutch lever and the wheel, whereby the type-wheel will be advanced up to the time that it becomes engaged with its driving shaft.

271. ELECTRO-BATHING APPARATUS; Wm. W. Karshner, Cincinnati, Ohio.

Claim—1st, The suspending non-conductor bands and the conducting foot-plate, insulated from the bath tub by the non-conducting substance. 2d, The combined use of the above described non-conducting bands, the conducting foot-piece, and the non-conducting substance, or their equivalents, for the purpose of administering an electric bath for therapeutic purposes.

272. REVIVIFICATION OF BONE BLACK; Henry Kattenhorn, City of New York.

Claim—The method of washing bone black or animal charcoal in the purifying of sugar, as described.

273. KNITTING MACHINES; Chauncey G. Keeny, Manchester, Connecticut.

Claim—The employment of a card attachment to knitting machines, in the manner described.

274. MARINE STEAM ENGINES; Wm. Kennish, Jr., City of New York.

Claim—The application of an auxiliary pipe to the present discharge pipe of a marine steam engine, in the manner described.

275. MACHINE FOR CUTTING AND SETTING SAW TEETH; Columbia G. Loynes, Lenox, Massachusetts.

Claim—The devices for punching and shearing metals, arranged in connexion with the saw-gummer and saw-set, in the manner set forth.

276. MACHINERY FOR SCUTCHING FLAX; Wm. C. McBride, Raritan, New Jersey; patented in England, May 20, 1856.

Claim—The mode of operation of the combined rotating blades or beaters, with the interposed stocks. Also, combining two scutching machines, by means of the two feeding wheels, with their bands for transferring the fibres which have been scutched at one end, that the other may be properly presented to the second scutcher. Also, in combination with the two sets of feeding bands and wheels, the sustaining and guiding table, by which the upper unscutched ends of the fibre are held up, guided, and properly presented to the second scutcher, as set forth.

277. MANUFACTURE OF CANDLES; Antonio Meucci, Assignor to D. B. Loraine, Clifton, New York.

Claim—The method of forming mould candles in saturated porous candle moulds, in contradistinction to the method in general use of forming them in candle moulds of impervious metals.

278. HEATING APPARATUS; U. D. Mihills, Hartford, Wisconsin.

Claim—A heat controlling cylinder, in which the regulating disks, shaped as described, are connected with a detachable frame.

279. Washing Machine; Wm. H. Milhouse, Sugartown, Pennsylvania.

Claim—1st, Securing strips of india rubber edgewise in slots in the concave and rubber, by means of the slots which are bolted in between the successive strips. 2d, The arrangement of the adjustable frame, levers, swinging rubber, pitman, and shaft, with the concave, constructed in the manner set forth.

280. Bed Bottom; B. F. S. Monroe, Utica, New York.

Claim—The two frames with the spring secured between them, the frames being connected by the cross bands covered or enclosed by any suitable fabric, and the upper frame supporting the seat or mattress, as set forth.

281. Pumps; Walter Peck, Rockford, Illinois.

Claim—The combined arrangement of the stationary standard, vibrating lever, and lifting spring, with the plunger, as specified. Also, the combined arrangement of the hollow plunger having a cylinder and spout, and attached directly to the handle, with the stationary chamber and steadying springs, as specified.

282. Combined Punch and Awl; F. P. Pfleghar, Whitneyville, Connecticut.

Claim—The rotating hollow head provided with a series of cutter tubes of different sizes, in combination with the awl attached to, or forming a part of, the bent bar or rod, which, as well as the head, is attached to the jaw, and provided with a spring plate or stop.

283. Twisting Fibrous Substances; George W. Pittman, Bushwick, New York.

Claim—The application of the flyer, or its equivalent, in combination with the rollers and spool, or other equivalent means of holding the sliver, and taking up the twist produced by the flyer, whereby the same operation is made to spin the sliver into yarn, and twist the same with one or more other yarns, simultaneously.

284. Razor Strops; Michael Posz, Shelbyville, Indiana.

Claim—The self-lubricating razor strop, when constructed in the manner described.

285. Belt Trusses; H. H. Reynolds, Buffalo, New York.

Claim—The combination of the T-spring with the conical spring, pad, belt, and perineal strap.

286. Stoves; Philip Shreiner, Columbia, Pennsylvania.

Claim—The air-supplying tubes and air-heating cylinders, when combined with a stove, the heat of which is unobstructed by outside casings.

287. Photographic Plate Vices; M. M. Rison, Paris, Tennessee.

Claim—A photographic vice having its eccentric lever provided with a groove, a clamping jaw provided with a catch, to engage a jaw provided with a spring pawl, which engages a rack, and otherwise constructed as described.

288. Wagon Brake; Daniel Robinson, Lenox, Pennsylvania.

Claim—The combination and arrangement of the sliding frame, curved bars, attached to the rock shafts, and passing through the traverse bars of the frame, and the shoes, attached to the ends of the rock shafts, the several parts being fitted in the truck or bed, as set forth.

289. Machine for Splitting Wood; P. P. Ruger, City of New York.

Claim—The spring or yielding guide for relieving the cross-bars, in the manner specified. Also, the guide plate with the uprights, arranged in combination with the wood splitters, as specified.

290. Ball Furniture Casters; B. A. Russell, Deep River, Connecticut.

Claim—A furniture caster, when composed of cylinder or casing either with or without the radial set-screws or ribs, in combination with the plate and ball, constructed in the manner set forth.

291. Breech-loading Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Forming on the outer end of the sliding bush as the sole bearing point against the breech, an annular inclined projection with a sharp annular edge coinciding with the smallest portion of the bore of the said bush. 2d, The annular termination of the sliding bush fitting into an annular recess formed in the barrel, and over-lapped by the sharp-edged annular projection, as set forth. 3d, The convex base as fitted into a concave socket in the breech, so as to form a self-adjusting base for the end of the barrel.

292. Breech-loading Repeating Fire Arms; Christian Sharps, Philadelphia, Pennsylvania.

Claim—1st, Exploding in succession a number of cartridges of the class described, by means of a projection caused to revolve by the movements of the hammer, when the said cartridges are so arranged, in respect to the said projection, that the latter shall strike the edge only of each cartridge in succession. 2d, The catches, so arranged on the stock in respect to the bores of the barrel block, that on moving the latter from the breech, they may be the means of withdrawing the whole of the cartridge simultaneously from their respective bores, as set forth.

293. Boot Heels; Stillman Thorp, Portland, and Wesley Thorp, Turner, Maine.

Claim—The combination of the metallic plate spring or shank stiffener, and the rotary heel-piece, connected together and applied to the heel and shank of a boot or shoe, as specified.

294. Washing Machine; Wm. B. Twiford, Chincoteague, Virginia.

Claim—The opposing incline planes on the underside of the ends of the sliding roller frame, in combination with fixed concave projections or ledges on the sides of the tub or box, and with grooves of greater width than the diameter of the journals of the roller, in the sides of the box.

295. Lamps; Hezekiah Knowles, New London, Connecticut, Assignor to Fellows, Hoffman & Co., City of New York.

Claim—The lower or diaphragm reflector surrounding the wick tube at or near its upper edge, in combination with the upper deflector and the chimney, having suitable openings for the supply of a draft of air to the inside, and to feed the flame outside of the upper deflector.

296. Harvesters; Geo. W. Richardson and Robert Glover, Grayville, Assignors to selves, J. B. Williams, and Wm. A. Horrall, White Co., Illinois.

Claim—1st, The jointed spring arm, in combination with the spring catch, operating so as to catch and hold the arm when it has gathered the grain, and retain it in this position until the bundle is ready to be deposited free from the platform. 2d, The raker, in combination with the rod, crank, rest, and retracting weight, arranged to produce the reciprocating movements for gathering and delivering the gavel, in the manner described. 3d, In combination with the arm, the connecting rod, and bent lever, operated through the medium of rod, pin, and rest, by the driving-wheel.

Extensions.

1. Coal Stoves; Henry Stanley, Poultney, Vermont; patented January 4, 1845; extended January 4, 1859.

Claim—The manner in which I have combined and arranged the two stories thereof, consisting of two cylinders, with the eight triangular radiating flues, arranged around and in contact with them, said flues communicating with the flue space in the pintle, with the intermediate chamber, and with the corner space; the two latter being divided by partitions into anterior and posterior portions, and there being also openings through the upper end of the upper cylinder into the cornice space: it being distinctly understood that I do not make any claim to either of the individual parts, taken separately and alone, but that I limit my claim to the combination and arrangement thereof as a whole; not intending, however, by this claim, to confine myself, in constructing my stove, to the particular form of the respective parts, but to vary these as I may deem expedient, whilst I attain the same end.

2. Saw Cotton Gin; Eleazer Carver, Bridgewater, Massachusetts; patented January 4, 1845; extended January 4, 1859.

Claim—The combination of a cylinder brush, having fans on the ends thereof, with a cotton gin.

Additional Improvements.

1. Cross-cut Sawing Machine; Albert Heth and Gaylon Hall, Adams Centre, New York; patented August 24, 1858; additional dated January 11, 1859.

Claim—Attaching the bar or beam to the vertical bar by a pivot, and securing the bar or beam and beam, in a proper relative position with each other by means of the rod, loop, and nut, or their equivalents, so that the bar or beam may be more or less inclined according to the thickness of the log, and the bar always retained in a vertical position. Further, in combination with the oscillating platform, lever, and saw-bar, the bar provided with an adjustable weight, and arranged as set forth.

2. Hominy Mortars; John Reezer, Chillicothe, Ohio; patented March 2, 1858; additional dated January 18, 1859.

Claim—The application and combination of the slide with its spring, and roughening of the lower end of the pestle.

Re-Issues.

1. Regulating the Flow of Oil to the Wick in Carcel Lamps; Abraham Coates, City of New York; patented March 25, 1856; re-issued January 4, 1859.

Claim—Regulating the supply of oil to the burner by means of the self-employing drip cup, operating upon the supply valve. Also, placing the fountain or reservoir for the oil above the lens, with its draft opening and its supply pipe, within the barrel or chamber of the lens.

2. Machine for Making Hames; Henry Burt and James Y. Hedden, Newark, New Jersey; patented Feb. 17, 1857; re-issued January 4, 1859.

Claim—The forging of metal into useful forms by the employment of two or more pairs of rolls having their surfaces cut away, and combined, and rotating, and pressing the metal progressively into shape, being conducted from one pair of rolls to another through the agency of the guide.

3. Machinery for Dressing Screw Heads; H. A. Harvey, City of New York, Assignee (through mesne-assignment) of Thomas W. Harvey, late of said New York, patented August 18, 1846; re-issued January 4, 1859.

Claim—1st, The employment of a pair of spring pincers which receive the blanks one at a time, and present them to the jaws point foremost. 2d, In combination with the mandrel and jaws, or equivalent means for receiving and holding the screw blanks, the employment of a punch or driver for inserting the blanks to the required distance. 3d, The combination of the movable rest with the movable cutter head, and for the purpose of giving support to the blank and get out of the way so soon as the cutting operation is completed, and is claimed, whether the cutting operation be perforated on the head, or any other part of the blank. 4th, The particular manner of constructing the adjustable turning head, the slide or seat piece, the tool-holder sliding on the piece, between the check pieces, with the respective adjustments thereof, combined, arranged, and operating so as to effect the setting of the tool; the manner of operating the griping dies, and of separating the blanks in the hopper and conveying them to the feeding fingers, being similar to those described and used in the machine for cutting the threads.

4. Sewing Machines; Anthony W. Goodell, Brooklyn, and Nelson R. Scovell, Albany, New York, Assignees (through mesne-assignment) of Wm. Lyon, Newark, New Jersey; patented December, 1854; re-issued January 4, 1859.

Claim—1st, The combination of a feeding foot pressed on to the cloth and moved to feed the cloth, and then released from said cloth and returned to its former position, with a clamping foot that is raised when the feed of the cloth takes place. 2d, The vibrating bar, feeding foot, arm, and vibrating studs, arranged and acting to communicate motion to the feeding foot. 3d, A looping instrument constructed with a cavity or notch, and an eye carrying the second thread, and receiving a sideway movement after the said looper has passed through the loop of needle threads, for the purpose of carrying the second thread across and beyond the descending path of the needle, when said looper remains in a position for the needle to enter said cavity or notch, as it descends between the looper and second thread, and then said looper receives a sideways movement to its original position to clear the needle in drawing back. 4th, The reciprocating looper formed with the cavity, and with an incline, in combination with a stationary screw, or its equivalent, to communicate the required movement to the looper. 5th, The arrangement of the segmental spring, looper, and arm on the rocking shaft, for the purpose of adjusting and securing, by the screws, the looping point in the desired position with great ease and accuracy.

5. Safety Indicator for Steam Boilers; Lucius J. Knowles, Warren, Massachusetts; patented February 10, 1857; re-issued January 11, 1859.

Claim—1st, A feed apparatus, controlled by expansion and contraction, in combination with an expansion tell-tale, placed below the desired water level and above the level to which it would not be safe for the water in the boiler to descend. 2d, The described arrangement of the vessels, and as applied and connected with the feed pumps and steam whistle, for the purpose of regulating the pump and sounding an alarm. 3d, Connecting the pipe with the boiler, by means of the feed pipe, as set forth.

6. LAMPS; Edward F. Jones, Boston, Massachusetts; patented May 4, 1858; re-issued January 11, 1859.

Claim—Securing the chimney to the removable deflector, and both of them to the lamp cap, by means of a spring, operating in the manner set forth. Also, a detached deflector, in combination with a chimney, when the chimney is secured to the cap independently of the deflector.

7. VENTILATING WINDOW FOR RAILROAD CARS; George Neilson, Boston, Massachusetts; patented May 30, 1854; re-issued January 18, 1859.

Claim—The convergent ventilating window as made, with deflecting and light penetrating sides or surfaces, and an air opening, and a closing window or cover, essentially as explained, and to be applied to the opening of a side of a railway car, substantially as specified. Also, the arrangement of a deflector guard entirely around the window opening and in respect to the deflecting sides, as specified, not intending to claim a deflector or guard as applied to a car window opening, but to claim its arrangements on four deflecting sides or planes, and entirely around the opening between them.

8. RECLINING CHAIRS; Augustus Eliars, Boston, Massachusetts; patented May 11, 1858; re-issued January 25, 1859.

Claim—1st, The general arrangement of devices described for actuating and sustaining both the back and foot-rest, the same consisting of the arms attached to the back in a projection thereof, and having a shaft which travels in grooves, formed in the supporting frame work of the chair and the arms, the whole being combined with the foot-rest and frame. 2d, The combination of the device described, whereby the back can be placed and held in any desired position, and at the same time the proper length of arms retained, the same consisting of the hinged rails, sliding arms, locked upon said rails in any desirable manner, and mortises to receive the said rails, as set forth. 3d, The foot-rest, when combined with a spring or weight, or its equivalent, to operate as set forth, so that the said foot-rest may be raised or lowered at will, to adapt itself to the length of the limb of the occupant. 4th, In combination with a reclining chair, the pecular joint between the back and arms, consisting of the arm attached to the back, and turning upon a pivot in the groove or mortised sliding arm, whereby a very long arm may be obtained.

9. HULLS OF STEAM VESSELS; Ross and Thomas Winans, Baltimore, Maryland; patented October 26, 1858; re-issued January 25, 1859.

Claim—Constructing the hull in the form of a spindle, substantially as described.

DESIGNS.

1. DINING-ROOM STOVES; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.

2. COOKS' STOVES; Conrad Harris and Paul W. Zoiner, Assignors to Harris, Zoiner & Co., Cincinnati, Ohio; dated January 4, 1859.

3. PARLOR STOVES; S. W. Gibbs, Albany, Assignor to Evan Backus, Stuveysant, New York; dated January 11, 1859.

4. INK BOTTLES; Thaddeus Davis, City of New York; dated January 11, 1859.

5. COOKING STOVE; J. K. Hyde, Troy, New York; dated January 18, 1859.

FEBRUARY 1.

1. APPARATUS FOR RAISING AND FORCING FLUIDS; Manoah Alden, Philadelphia, Pennsylvania.

Claim—The wheel with any convenient number of buckets formed by the opposite curved vanes, said vanes being placed obliquely to the plane of rotation, and being of a tapering form, so that the buckets may be broader near the centre of the wheel than at the edge of the same, in combination with a wheel race or chamber adapted to the form of the buckets, and with the spiral channel.

2. BURNERS FOR VAPOR LAMPS; Charles F. Allen, Indianapolis, Indiana.

Claim—The combination and arrangement of the tube and lighter, constructed as set forth.

3. COTTON PRESS; Zachariah Atkinson, Richmond, Georgia.

Claim—The cam rollers, in combination with the levers, as set forth.

4. GAS COUPLINGS; J. B. Atwater, Berlin, Wisconsin.

Claim—The arrangement of the tumbler, rod, connecting piece, lever, which is provided with a foot-piece, pin, rollers, and door or platform.

5. PUMPS; Charles F Bellows, Seneca Falls, New York.

Claim—The arrangement and construction of a pump, as set forth, by means of right-handed and left-handed screws, the threads of one operating within those of the other.

6. OVENS; D. P. Burdon, Brooklyn, New York.

Claim—1st, The arrangement of a series of hinged cars around a disk plate, so that they will deliver bread pans with their contained bread at the proper place of discharge, and also receive the said pans in their revolution; and in combination therewith the circular track, so arranged as to support the ends of said cars upon friction rollers, while at the same time allowing each car to deposit its pan at the proper place, and restore said cars to their proper position to receive the return pans with their bread. 2d, Operating the sliding doors by means of the radial arms, or their equivalents, projecting from the driving shaft, so that the doors will be alternately opened and closed at the proper time for delivering the bread, and receiving the bread to be baked. 3d, Operating the traversing follower by means of radial arms, or their equivalents, for feeding the pans into the oven, when the same is so arranged that the pans will be fed into the cars while the door is open; and in combination therewith, the compensating pulley wheel and weight, for equalizing the motion and returning the traversing follower.

7. FLUXES FOR PUDDLING IRON; John Burnish, James Talbot, and Thomas W. Yardley, Pottsville, Penna.

Claim—The silicious sand, loam, alum, clay, lime, oxide of iron and talcose rocks, when used collectively in, or nearly in, the proportions described, as a flux in the process of puddling iron.

8. WASHING MACHINE; Zjiba Casterline, Liberty, Indiana.

Claim—The employment of balls attached to the rubber of a washing machine, when said rubber has a reciprocating movement in the tub, constructed in the manner set forth.

9. MACHINE FOR POLISHING METALS; Reuben Cave, Louisville, Kentucky.

Claim—The running of two polishing grit stones edge to edge, in opposite directions, one immediately above the other, and both running at the same time, the upper stone running one-third faster than the under one.

10. RAILROAD CAR SEATS; Willis L. Childs, Piermont, New York.

Claim—Attaching to each end of the planes or boards, a curved or segment bar, lapping by each other, so that they will form an arc, having for its centre the point at which the planes or boards are hinged or jointed. Also, suspending a car seat upon the point, in combination with the hinging of the planes or boards, so as to enable it to be reversed without concussion, and also to be used as a reclining seat or sleeping couch.

11. WATER WHEEL; Wm. Coutie, Troy, New York.

Claim—The stationary plates, arranged so as to prevent a rotary motion in the water when acting on a screw wheel. Also, placing the gate below the surface of the back water, in connexion with the draft tube, for the purpose specified.

12. STOVES; Porter Dodge, Francistown, New Hampshire.

Claim—An improved air-tight stove, the several parts being constructed and arranged in relation to each other, substantially as described.

13. METHOD OF VARIEGATING WOOD; Joseph Cowee, Jr., Keene, New Hampshire.

Claim—The employment of rollers, in the manner described, for the purposes of variegating wood.

14. SPLICE OF BAR RAILS; Wm. M. C. Cushman, Albany, New York.

Claim—In combination with the flat bar rail, the splice plate or piece, constructed in the manner described.

15. HARVESTERS; Charles G. Dickinson, Poughkeepsie, New York.

Claim—The combination of the curved arm, curved feet, and braces or compressors, with endless belts or chains, when arranged with relation to each other and to the platform, in the manner described.

16. ENVELOPE MACHINE; James B. Duff and Thomas W. Keating, City of New York.

Claim—1st, The combination of the pasters, the grooved pressure fingers, and the spring plates. 2d, In combination with a feeding table, having its surface composed of india rubber, or other elastic substance, the use of a plunger operating through a die above the said table, and provided with sharp projecting edges for the purpose, after it has forced the blank through the die, and thus turned back the flaps, of making a sharp crease where the fold is to be made, by pressure between said edges and the elastic surface. 3d, Placing the faces of the lappers in front of their centres of motion, and their axes above the level of the table, so that the plunger, when it descends, shall pass close against the faces of the lappers, and the heels of the lappers, when the latter close, will move outward away from the paper. 4th, Having an open space between the heel of the lappers to receive and hold the edges of the paper, when it is pressed therein by the descent of the plunger.

17. APPARATUS TO MANUFACTURE STARCH; Wright Duryea, Glen Cove, New York.

Claim—1st, The described system of arranging and combining the grinding, washing, and bolting apparatus, to wit: the arrangement of all the stoves side by side, with their respective washers conveniently placed below them, with the arrangement of the bolting cylinders below their respective stones in horizontal series, with one or more interposed endless chain elevators, combining them with the stones next in order of succession in the series, whereby the whole apparatus is brought within two stories of a building, and convenience is afforded for its supervision, and the other advantages set forth are obtained. 2d, The combined arrangement of the lower bolting cylinders and inclined plane or table, with the troughs or gutters, whereby I am enabled to convey away the starch water and the tailings from the said cylinders, by a single conductor for each purpose.

[This invention relates to the process of obtaining the starch water from which the starch is subsequently extracted, by grinding the grain between stones, then washing with water, and passing the ground grain and water through bolting cylinders, re-grinding the tailings from the cylinders, re-washing and re-bolting, repeating the re-grinding of the tailings, and the re-washing and re-bolting of the products, till nothing of the grain remains but the bran. Also, in the employment, in combination with a series of bolting cylinders arranged side by side, of a flat surface of sufficient extent to receive the starch water from the whole series, by which means a freer circulation of air is obtained through and between the cylinders than when separate concave troughs are employed under each one, thereby preventing the so rapid clogging of the bolting cloths, and obviating the necessity of the so frequent removal and washing out of the said cloths.]

18. MACHINE FOR TURNING OR EDGING BRICKS; Charles O. Farrington, Brewer, Maine.

Claim—The slats attached by joint hinges to the bars, A A, and connected by joint to the bar, F, which has the spring attached to it.

19. ESCAPEMENT FOR TIME-KEEPERS; Charles Fasoldt, Rome, New York.

Claim—The employment of a straight lever and collateral hook, in the position and form described.

20. MACHINE FOR MAKING WOODEN TROUGHS; Samuel T. Field, Worcester, Massachusetts.

Claim—Arranging the bearings of the saw and the mechanism by which it is driven, whereby the upper surface and also the interior of the saw is left unobstructed. Also, in combination with a cylindrical saw, a secondary cutter, arranged so as to groove the core of the stick while it is being sawed out by the cylindrical saw.

21. CRACKER MACHINE; Joseph Fox, Lansingburg, New York.

Claim—1st, The depressions in the spaces between the grooves in one or both of the rollers that form the strips of dough from the sheet. 2d, Forming short sections of skin-covered strips of dough into disks or crackers, by pressure applied to ends of the sections, by the devices described. 3d, The rollers, by which the crackers are rolled on the apron, and by which the skin on the upper surface of the pressed crackers is improved. 4th, The combination of the straight edges for evening the rows of crackers before rolling, and also for docking with the dockers. 5th, The employment of the clamp bars, in combination with the knife, to cut off and hold the sections of the strips of dough, as the strips are fed through the bar. 6th, The plane, follower, and second endless apron, as combined and arranged among themselves, and with the other endless apron, for the purpose of taking rows of crackers from a moving endless apron, and placing them upon the bake-pans.

22. SLIDE VALVES FOR STEAM ENGINES; James Freeland and R. H. Lecky, Allegheny, Pennsylvania.

Claim—1st, The arrangement of the armed flanch on the steam pipe, the columns, the studs, with nuts,

and the cap, the whole being arranged and secured to the valve seat, as described. 2d, The arrangement of chamber with opening, as described. 3d, The combination and arrangement of the armed flanch on the steam pipe, columns, studs, with nuts, stuffing-box, cap, and slide valve, with the valve seat, arranged as described.

23. HANDLES FOR TABLE CUTLERY; J. W. Gardner, Shelburne Falls, Massachusetts.

Claim—A table knife having its handle composed of two or more parts, the ends of which are encompassed by ferules, and otherwise constructed as described.

24. SPERMATIC RINGS; Dwight Gibbons, Rochester, New York.

Claim—The employment in a ring encircling the penis of a sharp pin or point attached to a spring which is held by a roller, or other equivalent rest, so as to prevent the protrusion of the said pin within the interior surface of the ring till distension of the penis occurs, and by its action on the spring causes its liberation from the roller or rest, and thereby permits the said spring to force the pin or point into the penis, with a sudden action, instead of with the gradual action peculiar to the points of other rings for the same purpose. 2d, The combination of the two semicircular or nearly semicircular springs, with the two rigid sockets, by means of a slot and set-screw in one of the sockets, which permits the ring of the instrument to be adjusted to organs of various sizes.

25. RAILWAY CHAIRS; J. W. Gould, Elmira, New York.

Claim—The self-securing "lock wedge," arranged in combination with the rails, chair seat, and key, in the manner specified.

26. RETORTS FOR DISTILLING COAL OIL; N. B. Hatch, Lawrenceville, Pennsylvania.

Claim—The application and use in retorts used in the distillation of coal, or other substances, from which oil or gas is producible, of a sweep bar or arm with plates attached, and operated so as to push or spread the material placed within over the floor or bottom, and at intervals discharge the same continuously in openings at or near the edge of the retort.

27. SCRUBBING PAIL; A. P. Hawse and L. J. Adams, Morrisville, Vermont.

Claim—The combination of pail, rollers, and pieces, as set forth.

28. SHIRT COLLARS; G. W. Beard, Boston, Massachusetts.

Claim—As an improvement in the "turn down collar," the construction of the same with four cravat slots or passages, arranged therein or with respect to the ends of the inner fold of the collar, and for the purpose of receiving a cravat or tie ribbon. Also, the described mode of applying or arranging a cravat or neck tie in the collar, constructed with the four slots or passages arranged within it or with respect to the ends of its inner fold, essentially as explained.

29. WASHING MACHINE; John Hebden, Medford, Massachusetts.

Claim—The machine constructed with a removable dasher, or its equivalent, and a removable platform, combined and arranged with the suds reservoir and mangle rollers, as set forth, the whole not only enabling the operations of washing the clothes, expressing the water from them, and mangling them to be carried on consecutively, but causing clothes to be drawn out of the suds reservoir, and the express water to be received into it.

30. MILL FOR GRINDING CANE, &c.; Isaac A. Hedges, Cincinnati, Ohio.

Claim—1st, Surrounding the openings in the top and bottom plates with annular ledges, when employed in connexion with rollers having recesses corresponding with them in their top and bottom ends. 2d, The regulator and adjuster. 3d, The oil tubes, when used in connexion with a recess containing waste oil, to conduct the same through the rollers to the bearings below. 4th, The corrugated shells, in combination with the rollers, for the purpose of readily converting the mill into a corrugated mill.

31. CLOTHES FRAME; Dexter Henshaw, Fitchburg, Massachusetts.

Claim—The combination of the four arms and the block with the cords, screws, and braces, as described.

32. MACHINE FOR GRINDING AND POLISHING SAWS; J. A. Hendricks, Providence, Pennsylvania.

Claim—The grindstone or emery wheel, in combination with the feed rollers placed in the adjustable frame, as set forth.

33. ROTARY HARROWS; W. T. Hildrup, Harrisburgh, Pennsylvania.

Claim—Giving the sleeves an invariable connexion at one extremity, and a variable connexion attached to the draft bar at the other.

34. MACHINE FOR MAKING MEAL AND FLOUR; G. W. Holman, Beloit, Wisconsin.

Claim—Placing a series of knives supported by gudgeons in a circle, or part of a circle, so that the thickness of the shaving cut by the edge of one knife shall be gauged by the back of the knife next to it. Also, placing a series of knives, supported by gudgeons, so that the rankness of set of all of them may be uniformly graduated by one operation, and so that their faces may be thrown back into one uniform surface for grinding or sharpening. Also, the band at the end of the knives, constructed as described. Also, the arrangement of the reversed screw threads on the arbor, and the reversed screw threads on the core, for the purpose of moving grain in opposite directions at the same time, as combined with the other parts of my machine.

35. MILL FOR GRINDING GRAIN; Wm. H. Hope, Washington City, D. C.

Claim—1st, The combination of a cylindrical corn and cob cutter and crusher for grinding food for cattle, with two sets of grinding surfaces, arranged as set forth. 2d, The arrangement by which the cylindrical rollers or cutters and crushers and grinding surfaces may be operated together or separately, as described. 3d, The mode of regulating the cylinders and stone for the purpose of grinding coarse or fine, by the use of the screw lever attached to the journal boxes, which move on ears or lugs firmly attached to a frame, in the manner described.

36. APPARATUS FOR REGULATING THE DRAFT OF ENGINES; W. S. Hudson, Paterson, New Jersey.

Claim—1st, The interposition of a perforated diaphragm between the steam and exhaust pipes, and extending down to or near the level of the lower tubes. 2d, Making the apertures above the base of the diaphragm of such area that when the locomotive is standing still, the gaseous products of combustion may flow through without serious obstruction, but that when the combustion is increased by the blast, a large portion is compelled to pass underneath.

37. OVENS; George C. Jennison, Ware, Massachusetts.

Claim—The application of the baking chamber of the endless carrier to the furnace, in such manner that the air within the said baking chamber may come into direct contact with the furnace charge or heated volatile products arising therefrom, and be heated thereby without the heat having first to pass through any divid-

ing wall or partition, or its equivalent. Also, the arrangement of the baking chamber with respect to the furnace and its discharge flues, whereby the advantage of the ascending power of the heat is availed of, while the smoke is carried off by the flues. Also, the arrangement of the charging and discharging orifices of the baking chamber, with reference to it and the lower smoke eduction passage leading into the discharge flue of the oven. Also, the arrangement and application of the pendulous platforms and the endless carrier, together and within the vertical baking shaft. Also, the combination and arrangement of one or more openings and their dampers, with the baking chamber and its furnace and flues.

38. Weighing Scales; O. W. Jipson, Rochester, New York.

Claim—1st, The sliding block, when provided with the rollers and slide or supplemental weight, arranged with or without the rack and pinion. 2d, The adjustable block, provided with the slide or weight and graduated bar, in combination with the nut or supplementary weight. 3d, The attachment of the lever to the platform frame, whereby the same may be adjusted farther in or out from the frame, as circumstances may require. 4th, The arrangement of the bars with their sockets and with the frame, to admit of the adjustment of the bars to receive platforms of greater or less size, as required. 5th, The employment or use of the sleeve attached or applied to the beam.

39. Floating and Revolving Derrick; E. Jones, Brooklyn, New York.

Claim—The arrangement of the turn-table or frame, which carries the derrick, when placed on the bottom of the scow or below the deck. Also, supporting the upper turn-table or frame of the derrick, by means of a circle and wheels.

40. Horse-shoe Machine; Wm. W. Lewis, Cincinnati, Ohio.

Claim—1st, The combination in a pair of rolls of a groove and creasers, which will, by their joint operation, exert pressure in a lateral as well as a longitudinal direction. 2d, In combination with the above, dividing the rollers radially and vertically.

41. Tool for Crozing and Chamfering Barrels; H. Martin, Louisville, Kentucky.

Claim—The stock provided with the rollers, arranged so as to be capable of being adjusted longitudinally and laterally in the stock.

42. Apparatus for Increasing the Draft of Furnaces; J. B. Martin, Wilmington, North Carolina.

Claim—1st, The combination of a fan with the exhaust when arranged within the smoke-stack, so that the exhaust steam, as it issues from the exhaust pipe, acts directly on the blade of the fan, and then passes with the products of combustion in a direct path through the fan and through the smoke-stack, thus causing the fan to turn with high velocity, and thereby accelerating the draft of the furnace. 2d, The combination of the deflecting plates with the blades of the fan, for the purpose of intercepting sparks and cinders.

43. Sleeping Cars; T. E. McNeill, Philadelphia, Pennsylvania.

Claim—1st, Constructing the seat of the swing seat of a railway car with guiding strips, or their equivalents, and padded leaves hinged together and to the seat, so that the latter may be extended and form a comfortable couch for sleeping purposes. 2d, The frame arranged to receive the padded board, when the frame is hung to one end of the couch, and the board to the opposite end by rods, and when the whole is combined with the swing seat of a railway car, so as to form a rest for the back during the day, and a sleeping couch for the night.

44. Coffee Pots; C. A. Merchant and G. L. Patterson, Frankfort, Kentucky.

Claim—The combination and arrangement of the cylinder in the reservoir and the tubes, in the manner described.

45. Clover Pickers; Wm. T. Mills, Galesburgh, Michigan.

Claim—Providing the teeth with the holes and angular plate, when arranged at the front edge of the adjustable platform or box, and in relation to each other, in the manner described.

46. Discharging Water from Floating Dry-docks for Canals; Stephen F. Palmer, City of New York.

Claim—The manner of discharging the water from a floating dock by means of the underground trunk, in combination with the flexible apparatus to convey the water from the dock without interfering with its rise and fall. Not confining myself to any particular manner, provided it produces the same result of giving the water a self-acting discharge.

47. Variable Exhaust Pipe; Wm. P. Parrott and Stephen H. Head, Boston, Massachusetts.

Claim—The contracting orifice for blast pipes, in the manner set forth.

48. Variable Exhaust Pipe; Jones Patrick, Chicago, Illinois.

Claim—In combination with a revolving cylinder or plate of variable-sized exhaust openings, the rock shaft, pawl radius bar, and their several connexions, in the manner set forth.

49. Sash Supporter; John F. Peabody, Salem, Massachusetts.

Claim—My arrangement of the rack bar with reference not only to the groove of the window frame, but to the inner side of the sash and to the catch applied thereto, the rack-bar, under such arrangement, not only being in full view with the catch, at any altitude in which the window sash may be placed in the frame, but operating not only to support the sash at such altitude, but to maintain it within the groove.

50. Photographic Plate Vise; Sylvester W. and Washington L. Pearsall, City of New York.

Claim—The spring rocking jaw and lever, in combination with the movable jaw. Also, the jaw pieces or facings of hard rubber or gutta-percha, for the purposes specified. Also, the arrangement of the rod, stock, and gudgeon, entering the socket, and having the set-screw, by which the apparatus is retained in position horizontally.

51. Cotton Bale Hoops; G. W. Penniston, North Vernon, Indiana.

Claim—The tye or friction key, constructed with convex inner bearings, in the manner specified.

52. Harvesters; Sylvester Persons and Alfred W. Cone, Panama, New York.

Claim—1st, Arranging and operating the chain cutters upon an adjustable and vibrating cutter frame, in the manner described. 2d, The arrangement of two or more rollers relatively to the chain cutters, multiplying wheel, and adjustable vibrating cutter frame, so that the rollers will form a bearing for the chain cutters, and support and hold the chain in gear with the multiplying wheel, whatever may be the position of the adjustable vibrating cutter frame in passing over unlevel surfaces.

53. Fanning Mills; J. E. Rice, Oneida, New York.

Claim—The arrangement and combination of the suction chamber, spouts, plate, and shoe, as described.

54. FILTERING APPARATUS; Nathan F. Rice, New Orleans, Louisiana.

Claim—1st, Passing the water through the filtering medium from below upwards, in the manner specified. 2d, The concavo-convex perforated false bottom or diaphragm, constructed as described. 3d, The air tube leading from the lower chamber, as specified.

55. FIRE AND VENTILATING APPARATUS FOR SHIPS; John W. Richards, City of New York.

Claim—1st, Arranging and applying the pipes, or their equivalents, leading to the different parts of the vessel, in combination with suitable connexions with a boiler and a blower or air-forcing apparatus, that the said pipes may be used as required, to supply either air for ventilation or steam for the extinction of fire. 2d, Applying the several lengths of pipe in a train so that they are capable of being turned in their joint boxes or supports, for the purpose of giving such direction to the ventilating air supplied by each length, as the occupants of the berth or part of the vessel supplied by it may desire.

56. OVENS; Thomas Russell, City of New York.

Claim—The employment in an oven, in combination with permanent ways or tracks, arranged at right angles to each other within, without, and through the door-ways, and with a series of carriages to run on such ways, of a system of horizontal screws and endless chains, and of teeth, or their equivalents, on said carriages, to connect with said screws and chains. Also, the opening of the oven doors to admit and permit the exit of the carriages by the direct action of the doors of the carriages themselves, thereby dispensing with special machinery for that purpose.

57. BURR STONE MILLS; Gelston Sanford, Poughkeepsie, New York.

Claim—1st, The mode of constructing the casing or shaft with a vertical or upright joint, in combination with the lever and edges as a fastener for the shell. 2d, The grinding part and the elevating part, in combination with the cone and shell, in the manner specified.

58. HINGE; Samuel S. Squire and Theodore Scharfenburg, Brooklyn, New York.

Claim—Providing the half leaves on one side of a butt with the hinge pins, which are sold with the pattern and form part thereof, when cast in the manner specified.

59. DRESSING MILL-STONES; Alfred Sheek, Smith Grove, North Carolina.

Claim—In combination with a plane surface land, the depression, and convex furrow or surface, in the manner described.

60. ROTARY STEAM ENGINE; H. B. Thomas, Portage City, Wisconsin.

Claim—1st, So constructing and combining a piston wheel and sliding pistons with two eccentric cylinders, one outside and the other inside the said wheel, that with a proper arrangement of induction and eduction passages, those parts of the pistons within the rim of the wheel, as well as those without, are rendered effective in the operation of the engine, and it is thereby rendered double-acting, either in its employment as a motor or as a pump, or as a combined motor and pump. 2d, The combined arrangement described, of the passages and cavities in the cylinder head, ring valve, and bonnet.

61. SEWING MACHINES; Wm. W. Wade, Longmeadow, Massachusetts.

Claim—The application to sewing machines of the ratchet or corrugated wheel and pawl, the pawl being kept in place by a friction cam, or its equivalent, and the motion being communicated to the machine, either by a double crank or by a single crank, or other appropriate means.

62. MACHINE FOR GRINDING SAWS; George Walker, Port Jervis, New York.

Claim—1st, The arrangement and combination of the wheel and bed-plate, whereby said driving wheel is made to drive the bed-plate, and also to compensate for the pressure of the grindstone. 2d, The flat-bottomed water recess in the face of the bed-plate, as shown.

[This invention consists in supporting saws during the operation of grinding them, upon a horizontal bed arranged below the grindstone, by which means the chattering of the saw, and consequent waviness of its surface are obviated, and the water used in grinding, and what is termed the "cut," viz: the particles of stone worn off in the grinding process, are prevented flying away from the place of grinding, and by that means the grinding process expedited. It also consists in suspending the grindstone above the saw bed in such a manner that as much of the weight of the grindstone, and no more than is desirable, may be allowed to bear on the saw, and the grindstone is made to bear heaviest on the thickest parts of the saw, and thus sooner grind it to a uniform thickness than when the saw is applied in the usual manner. It further consists in a certain method of applying the power to drive a rotating saw bed for grinding circular saws, that the driving gear serves to confine the bed to the grindstone, and prevent the bearings of the bed wearing out of plumb.]

63. SIZING FOR COLORED PAPERS; Charles Williams, Philadelphia, Pennsylvania.

Claim—The employment or use, in a sizing for marbled and other colored papers, of the solution of the gum resin lac, in combination with a solution of either soap or bees-wax, or both, the said solutions being made and incorporated together in the sizing, in the manner described.

64. CAST IRON PAVEMENT; Chapman Warner, City of New York.

Claim—The mode of constructing pavements of iron frames of any size, substantially of the form described, placed at right-angles to each other, each surmounted by a single boss, which constitutes the traveling surface, it being so arched and placed upon the frame, and the frames so connected with each other, that the pressure arising from a weight imposed upon any boss, or upon any part of it, shall not be borne exclusively by one part of the frames, but shall be diffused over it and over the adjoining frames, the manner of connexion at the same time preserving the regularity of the surface, by preventing the elevation or depression of any one boss above or below the surface of the others, the space left by the frames to be filled with any material which the circumstances of each particular case may determine.

65. MACHINE FOR SHAVING THE HEADS OF SCREW BLANKS; Awrin Wood, Worcester, Massachusetts.

Claim—The wheel with its volute and twisted slot, in combination with the ways, or the equivalent thereof, to present the blanks in order, by means of which combination the blanks are separated one by one, and gradually brought to a horizontal, or nearly horizontal, position. Also, in combination with the wheel, having a volute and twisted slot, for receiving the blanks one by one from the separating wheel. Also, the combination of the inclined ways, the separating wheel, with its volute and twisted slot, the feeding tube and punch rod, or the equivalent thereof, with the jaws on the mandrel. Also, communicating motion to the separating wheel by an interposed spring spur or catch, or the equivalent thereof, that the spring connexion between the impelling mechanism and the separating wheel, or its equivalent, may yield to any obstruction, and thus prevent injury to the mechanism.

66. STEREOSCOPIC APPARATUS; James Lee, Assignor to self and Milton Finkle, City of New York.

Claim—The fan or segment hinge, or its equivalent, in combination with the picture-holders, for the pur-

pose specified. Also, the controlling band, or equivalent Also, the elastic band, or its equivalent, in combination with the pulley and rollers. Also, the picture-holder, as described. Finally, the combination as set forth and described, but do not confine myself to the exact proportions, as I may vary the same while I obtain the same end, by means essentially the same.

67. MEAT CLEAVER; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Mass.

Claim—The meat masticator, in combination with the cleaver, substantially as specified.

68. FLY-TRAP; Reuben Shaler, Madison, Connecticut, Assignor to George W. Shaler, City of New York.

Claim—The combination of the stud and cover, when arranged in connexion with the chambers, as described.

69. HARNESS SADDLE-TREES; Samuel E. Tompkins and John Maclure, Assignors to Samuel E. Tompkins, Newark, New Jersey.

Claim—The tubular projection on the bow of the tree, so as to form a case for the bolt, and permit the securing of the wooden seat block to the tree, without injuring the same or allowing it to work loose, and at the same time securing the check-rein hook to the tree.

70. MACHINERY FOR CUTTING FILES; Milton D. Whipple, Charlestown, Massachusetts, Assignor to the Whipple File Company.

Claim—1st, The circular rolling cutter, operating in the manner set forth. 2d, Holding the face of the blank which is being cut, up to a face plate or rest by pressure upon its opposite sides. 3d, Clamping the blank rigidly, while a cut is being made, and releasing it preparatory to its being fed. 4th, The wedges operating as set forth, for the purpose of clamping the blanks. 5th, The shield against which the blank rests, and which is fed up with the blank, in the manner set forth. 6th, The machine for cutting files, consisting essentially of the combination of the elements above claimed, and operating in the manner set forth.

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71. MACHINE FOR MAKING RIVETS, BULLETS, &c.; C. B. Allen, Philadelphia, Pennsylvania.

Claim—The revolving shaft with their inclined planes and former, and the mould wheels or formers attached thereto, in combination with the yoke and wheels, whereby the extremities of the shafts to which the mould wheels or formers are attached, are made to approximate and separate. Also, the bar and the inclined plane, in combination with the rod and cutter wheel, whereby the portion of metal which has been moulded or formed may, when so desired, be severed or detached.

72. RAILROAD SAFETY SWITCH; Giles S. Appleton, Burlington, Vermont.

Claim—1st, The combination of the broad and even switch rails with the broad and even traverse rails, long guide rails, and short lift and guide rails, when the same are arranged in relation to each other, substantially as described. 2d, Allowing the wheels to play upon the wide traverse and switch rails after leaving the short lift ways and guide rails, before they reach the main track.

73. METHOD OF OPENING AND CLOSING GATES; J. A. Ayers, Hartford, Connecticut.

Claim—The counterpoised or loaded platform, formed of two parts, connected by joints or hinges, and placed in the carriage way beneath the gate, and extending a requisite distance at either side of it, when said platform is connected by suitable mechanism with the gate to operate said gate Further, in connexion with the platform, the locking device formed of the drop bars, and the jointed levers connected with the bars, which are provided with the upright arms extending upward through the platform.

74. SAWING MACHINE; Benjamin Barker, Ellsworth, Maine.

Claim—1st, The saw-dust spout, arranged relatively with the edging saw and feed table, as set forth. 2d, The trimming saw, when used in connexion and arranged relatively with the edging saw to operate conjointly therewith, as described.

75. EARTH EXCAVATORS; Joseph P. Barker, Wayne, Ohio.

Claim—The manner of arranging and adjusting the apron, and operating the same by means of the bent levers, for the purpose of conveniently discharging the earth taken up at any desired point, and used in connexion with the adjustable wheels.

76. STEAM PLOUGHS; Samuel K. Bassett, Galesburgh, Illinois.

Claim—Having the wheels of the truck attached to separate axles with pivoted or swiveled inner bearings, the outer bearings of the axles being fitted in guides, and the outer ends of the axles being connected by rods with racks, into which pinions of shaft gear, the shafts being connected by the endless chains passing around cone pulleys placed in reverse positions on the shafts, being arranged to facilitate the guiding and turning of the machine.

77. BILLIARD REGISTER; Henry J. Behrens, City of New York.

Claim—The use of numbers instead of balls—technically called "points"—so arranged and worked by mechanism that any number of points made by the player may be readily marked on the number itself, and the amount of the thus successively marked points is made to be shown by the register by mechanism.

78. MONUMENTAL DAGUERREOTYPE CASES; Jacob Bergstresser, Berrigsburgh, Pennsylvania.

Claim—The combination of the central frame encased by a central raised bead on the rear side of a glass plate, with the outer frame encased by an outer raised bead, the central frame and outer frame being cast together on the same glass plate, and the outer one being deeper than the inner or central frame.

79. COFFEE POTS; E. H. Covell, City of New York.

Claim—1st, The combination of the chamber with the condensing chamber and condensing pipes. 2d, The combination of the condensing pipes with the steam pipe and trap, as described.

80. APPLICATION OF ELECTRICITY IN DENTAL OPERATIONS; Wm. G. A. Bonwill, Dover, Delaware.

Claim—In the application of electricity to dental purposes, the mode described of extracting or extirpating the dental pulp or internal nerve of teeth, to wit: by the application of a current of electricity through the instruments made use of in the performance of said operation, directly and constantly to the dental pulp or internal nerve, during the operation of cutting out or extracting the same.

81. PHOTOGRAPHY ON WOOD; Charles B. Boyle, Albany, New York, patented in England, Jan. 7, 1859.

Claim—1st, The described or substantially equivalent method of applying albuminous matter, and afterwards coagulating it by heat, so as to form an insoluble base within the pores of the wood. 2d, Taking pho-

tographic pictures upon wood, the pores of which have been filled with gelatine, or its equivalent, and subsequently removing the gelatine from the block without injury to the picture by the application of a warm solvent.

82. MACHINE FOR RIVING LATHS FROM THE BLOCK; J. L. Brown, Indianapolis, Indiana.

Claim—The combination and arrangement of the yoke, knife, plate, guides, with the pitmans, elbow levers, and rests, constructed as set forth.

83. MANUFACTURE OF RUBBER HOSE PIPES; John H. Cheever, Boston, Massachusetts.

Claim—The new article of manufacture, consisting of hose or pipe made of fibrous rubber by powerful pressure, and without seams or joints, as described.

84. HARVESTERS; George E. Chenoweth, Baltimore, Maryland.

Claim—The combination of the cam cylinder with the cross arm, slide bar, and slotted or jaw lever, constructed in the manner specified. Also, a slide bar having two cross arms provided with friction rollers, and working in the slotted box.

85. VALVE BUNG; Florian Dahis, Williamsburgh, New York.

Claim—A bung provided with an air passage terminating in a recess or chamber, in which a disk valve of rubber, or other suitable material, is placed, and secured therein by a plate provided with a hole, specifically as set forth.

86. WASHING MACHINE; Beriah Douglas, Appleton, Wisconsin.

Claim—The washing seat and the foot box as combined with the washing rocker and the hand supporters, and the clothes holder or wringer as combined with the washing tub.

87. CULTIVATORS; James Dundas, Little Rock, Illinois.

Claim—The arrangement of the half shovels in connexion with the bar, to be moved to the right or left at the pleasure of the operator.

88. CULTIVATORS; George Essington, Plainfield, Illinois.

Claim—The arrangement of the mould-boards and centre-piece, in combination with the coulter or standard, point, and shares, constructed as described.

89. FURNACE FOR SMELTING IRON; Squire M. Fales, Baltimore, Maryland.

Claim—The combination with the ordinary furnace of the arched chambers or recesses at the sides of the furnace, the opening in the crown of the arched recess or chamber, and the movable tymp at the external openings of the arched chambers or recesses, as specified.

90. CATTLE PUMPS; Daniel P. Farnham, Johnstown Centre, Wisconsin.

Claim—1st, The combination of the lever and rod, or their equivalents, with the gate and inclined platform, arranged as described. 2d, The strips of metal secured on the inside of the barrel of the pump, to prevent the valves from coming in contact with the plunger as it works up and down, in combination with the barrel. 3d, The packing ring, constructed as described, and kept up to the plunger by weights on the back side.

91. MORTISING CHISEL; J. B. Fisher, Beaver Dam, Wisconsin.

Claim—Constructing the tool with two cutting edges or portions of different lengths, as described.

92. MANUFACTURE OF CAST STEEL; Perry G. Gardiner, City of New York.

Claim—It is not simply the gradual and prolonged cooling of the metal after melting, as aforesaid—but the process as a whole of pouring the melted metal into intensely heated moulds, and then placing them, thus filled, immediately into the heated oven or furnace where they congeal, away from the external atmosphere, down to a cherry red heat, and then immediately plunging the ingots or bars into the highly heated oil, and retaining them immersed in it for a considerable time, as described.

93. MANUFACTURING TOOLS FROM CAST STEEL; Perry G. Gardiner, City of New York.

Claim—The process of treatment of the cast steel, by pouring it in a molten state into moulds of the shape and size required for tools, instruments, axes, &c., previously heated to a high degree of heat, the steel being melted in a closed oven or furnace, and then replacing the moulds so filled in an oven or furnace, away from the external air, and keeping them there until they have been cooled down to a cherry red heat, and then immersing the tools, axes, &c., into the fluid mixture of a temperature of from 100° to 150° Fah., as described.

94. GUN LOCK; J. A. Lowe, City of New York.

Claim—The rule joint, or its equivalent, in the link, as described.

95. MAIL BAG FASTENING; John C. Garland, Chicago, Illinois.

Claim—The employment of a slotted sliding strap, when made of a single steel spring, and used in combination with a series of narrow stationary iron guides, attached to the perforated flap of the bag, and with a steel spring having headed stop pins fitted between the front portion of the binding and the upper edge of the mail bag.

96. ROTARY SPADING MACHINES; George W. B. Gedney, City of New York.

Claim—A series of spades which are operated so as to descend edgewise into the soil successively in each others track, and then to move laterally to detach the slice of soil upon which they operate from the undisturbed land. Also, combining an endless series of spades, operating with a cam, or its equivalent, that controls their positions by means of spade handles, or their equivalents, that are connected with the blades of the spades. Also, adapting the machine to be moved either end forward, by constructing the device that imparts lateral movement to the spades in such manner that its position may be changed, and that it may be made fast in either position.

97. SKIRT HOOPS; James C. Gilbert, Winthrop, Maryland.

Claim—In connexion with the movable spools and springs placed or strung on the cord, a series of stationary abutment blocks fastened at intervals to the cord, and operating in manner specified.

98. PADLOCKS; John A. Goewey, Albany, New York.

Claim—The combination of the tumbler having attached to it the spring, with the tumbler having attached to it the stump, when arranged in the manner set forth.

99. ARMS OF BROADCAST SEEDING MACHINES; Henry J. Hale, Indianapolis, Indiana.

Claim—The combination and arrangement of the segments and hinge, constructed as set forth.

100. REFRIGERATOR; Samuel Hickok, Buffalo, New York.

Claim—The combination of the tube arranged with the tank, when combined with the case, as described.

101. DOOR LOCK; Joseph S. Hoard and Valorus O. Spencer, Mansfield, Pennsylvania.

Claim—1st, The combination of the key with the flanch and plate, by which the key is made to operate as a detent to prevent the return of the plate, which covers the outer key-hole. 2d, The combination of the stop upon the bolt with the key, in such a manner that when the key is in the position represented, the stop will strike against the key and prevent the return of the bolt. 3d, The stop on the flanch, when combined with the key, in the manner described, to prevent said key from being turned too far.

102. SOLE-CUTTING MACHINES; A. P. Howard and Allen Rowe, Jr., Stoneham, Massachusetts.

Claim—Arranging the sole-cutter on the lower end of, and at right angles to, a vertical shaft, and combining with such mechanism not only for elevating and depressing such shaft in line of its axis, but mechanism for producing successive semi-rotations of such shaft and cutter, the same operating so as to carry the sole-cutter toward and away from the bed, and to give to such cutter an intermittent rotary motion. And in combination with the mechanism for elevating and depressing the cutter, and that for rotating it under an arrangement of the said cutter, with respect to its shaft, we claim the guide tooth and the clutch recesses, arranged to operate in manner set forth. Also, the combination and arrangement of the concave sole-discharger and the convex sole former or bender with the cutter, and so as to operate together in manner specified.

103. DOOR SPRINGS; G. L. Hudson, Conneaut, Ohio.

Claim—The use of the standard, coil spring, stirrup, crotch lever connected with rod, link as operating vice-versa to gate or door, arranged or connected in the manner set forth.

104. LADIES' HOOP SKIRTS; Frederick Hull, Derby, Connecticut.

Claim—The combination of the sloping bustle springs, with the waist-band adjustable at the back and front, whereby the adjustment of the bustle is effected by the waistband alone.

105. SURVEYING INSTRUMENTS FOR DETERMINING INACCESSIBLE HEIGHTS AND DISTANCES; Marshall Angersoll, Grafton, Ohio.

Claim—The construction of a surveying instrument for taking distances and altitudes upon the general principle set forth. Especially, the arrangement of the three sights, or their telescopic equivalents, one of which is adjustable upon a scale, by which means and the adjustment of a target having the same horizontal scale, the distance of any object within the range of vision can be determined. In this claim I do not intend to confine myself to the precise arrangement set forth, but to use a telescope in which a similar adjustment of hair sights (or filaments of silk) are provided for upon a definite scale; neither do I intend to confine myself to any particular scale, but to adopt a decimal scale, or any other that I may see fit. I claim, especially, a horizontal target, having marked upon it a scale corresponding to that of the accompanying instrument, which target is to be used in connexion therewith. Further, the scale of altitude, in combination with the scale of distance to be used, in the manner specified.

106. DEEP SEA SOUNDING APPARATUS; Augustus Jonan, San Francisco, California.

Claim—The combination and arrangement of the several essential devices described, operating in the manner set forth.

107. METHOD OF VARNISHING AND PROTECTING SURFACES; Frederic Kuhlman, Paris, France.

Claim—1st, The process described of fixing the surfaces of fabrics (fibrous or textile,) or solid surfaces, as walls or masonry, by the application of a weak solution of an alkaline silicate, as the silicate of potash and soda, to said paint basis. 2d, For a similar purpose, the method described of laying a coating of artificial leather over the surface of the basis pigment. 3d, The described method of fixing and rendering printed papers and fabrics water-proof, and fixing the same by hot calendering. 4th, The described method of rendering the surface of plaster of Paris water-proof, and of preserving the same, by forming a coating of artificial sulphate of baryta upon said surface.

108. CHURN; Rufus Lapham and R. P. Wilson, City of New York.

Claim—The use of an exhausting or condensing pump, in connexion with the cream reservoir, for the purpose of forcing air upon the upper surface of the cream, or withdrawing it from it, in the manner described.

109. WATER WHEEL; C. V. Littlepage, Austin, Texas.

Claim—The wheel provided with curved buckets and attached to the shaft stepped in the block, and otherwise arranged as shown, in connexion with the spiral water passage in the block or bed.

110. MACHINE FOR RIVING STAVES FROM THE BLOCK; L. Lyman, James P. Hodgkins, and E. Rawson, Carthage, New York.

Claim—1st, Having the tubes of the rods or gauges fitted in blocks, which are adjusted by the screws, or their equivalent. 2d, Placing the rods or gauges in tubes in the lower end of which springs are placed, and on which springs the rods rest, for the purpose set forth.

111. ALARM CLOCKS; J. F. Mascher, Philadelphia, Pennsylvania.

Claim—The application of the rack, pinion, and snail, in the manner set forth, to the going part of a clock or watch, for the use and purpose described.

112. PADDLE WHEEL; John May, Columbus, Georgia.

Claim—So applying and arranging a frame outside of the wheel, and in combination with the axle or centre on which the floats rotate, or its equivalent, that the said frame may be turned about the wheel, and by being so turned will change the position of the said axle or centre, or its equivalent, relatively to the centre of the drum, and thereby cause the floats to be projected from the drum, in such positions relatively to the axis thereof, as may be desired.

113. HARVESTERS; Wm. K. Miller, Canton, Ohio.

Claim—The combination of the braces and rocking bar, as set forth. Also, the adjustable hinge plate, for the purpose described. And, finally, the combination of the shoe hinge plate, braces, and rocking bar, in the manner described.

114. STOVES; N. W. Northup, Greene, New York.

Claim—In a stove, constructed as described, the combination and arrangement of the partition with the flues and dampers, in manner specified.

115. SOOT AND SPARK ARRESTER; Washington Abram Peaslee, Indianapolis, Indiana.

Claim—The combination and arrangement of the cap, rod, walls, G F and Q, with the case or outer wall, C, flues, and wall, D, constructed in the manner set forth.

116. Device for Preventing Tremulous Vibration of Saw Gates; David Reynolds, Ogden, Indiana.

Claim—Combining the guide bar and boxing with the sash saw and fender posts, as described.

117. The Process of Manufacturing Caustic Alkalies; Henry Pemberton, East Tarentum, Pennsylvania.

Claim—The mode described of separating the solution of caustic soda, or other caustic alkaline liquid, from an insoluble precipitate, by the use of a filter, constructed in the manner described.

118. Heel and Spoke Shaves; Joseph A. Perley, Lynn, Massachusetts.

Claim—The combination and arrangement of the adjustable gauge and beveled shanks, so that the gauge may be moved in a plane but slightly inclined to the convex side of the knife toward the edge or from it.

119. Carpet-sweeper; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the bearings of the friction driving rollers in oblong slots of the box, and the rollers, in the specified relation to the ends of the revolving broom or brush.

120. Manufacture of Cheese; T. A. Redington and G. McCluer, Fredonia, New York.

Claim—The combination of the water-box, milk vat, the reserve water-box, boiler, pipes, and the six-way cocks, arranged to operate as set forth.

121. Machines for Stretching Leather; Albert W. Roberts, Hartford, Connecticut.

Claim—The constructing of the jaws of leather-stretchers with ways for the wedges to slide on, that the wedges may be so relieved from the leather when drawn back, that the leather can be put in without removing the wedge from the jaw. Also, making the frames of hollow tubes on which the jaws slide, and also the application of steam to said frames, for drying purposes. Also, the shaft and gears for throwing back the wedge.

122. Corn Huskers; Wm. N. Rowe, Sharpsburgh, Maryland.

Claim—The combination of the adjustable plate armed with spikes, with the endless apron and knives, constructed in the manner described.

123. Skates; N. C. Sanford, Meriden, Connecticut.

Claim—Attaching the runner of the skate to its stock by means of the springs, as set forth.

124. Cast Iron Pavement; S. T. Savage, Albany, New York.

Claim—Combining the blocks by the peculiarly arranged dovetails cast on the blocks, and the locking pieces composed of heads and feet fitting between the blocks and into their dovetails, as described.

125. Refrigerator; Wm. Sims, Dayton, Ohio.

Claim—The described arrangement of the ventilating passages communicating with the upper part of a receptacle, in the lower part of which are placed ice and articles to be cooled or preserved, and in whose lower part circulation of air is avoided, in the manner set forth.

126. Corn Shellers; J. P. Smith, Hummelstown, Pennsylvania.

Claim—The arrangement of the groups of short teeth, alternating with the smooth spaces, which are provided with the raised ribs, in combination with the sharp-edged teeth (with curved or straight edges), when arranged circularly in lines parallel with the axis of the wheel, and operating in connexion with the ear-holder, so as to act on the ears of corn nearly lengthwise thereof.

127. Regulating the Twist in Throstle Frames; Joel Smith, Northbridge, Massachusetts.

Claim—The expanding pulley, arranged to operate as described.

128. Grain Weighers; John B. Stoner, Bennington, Illinois.

Claim—1st, The rotary hopper, constructed as described. 2d, Suspending the rotary hopper upon the lever or scale arms, as set forth. 3d, The arrangement of means described, for operating and controlling the valve or door to the shute of the stationary hopper. 4th, Operating the indicators by means deriving their motions from the weighted end of the scale arms, in combination with the springs, or their equivalents. 5th, In combination with the suspending of the rotating hopper, the suspending of the weight, as described.

129. Sluice for Water Wheels; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The winged gates, arranged in combination with a series of scroll shutes, in the manner set forth

130. Water Wheels; John Temple, Assignor to Temple, Mills & Stout, Middletown, Ohio.

Claim—The construction and arrangement in central discharge water wheels of buckets, which have the described compound cyma-reversa and downward and outward curve, whereby the water acts on the wheel by percussion, reaction, and gravitation, and escapes freely without back action.

131. Machine for Tenoning Spokes; Webster Thomas, Oxford, Ohio.

Claim—The combination of the beds, constructed with support piece, wedge, and the double series of cutters, in the same cutter bearer, the construction and operation being as described.

132. Revolving Fire Arms; John Walch, City of New York.

Claim—The revolving chambers or breeches, fitted with two ranges of nipples, and firing the respective charges in succession.

133. Lasts; Daniel M. True, Rockland, Maine.

Claim—As a fastening for last blocks, the bolt, when formed with the notches, and combined and arranged with the spring, the pin, and last hook hole.

134. Underground Grain Ploughs; Augustus Watson, Walnut Run, Ohio.

Claim—So hanging a coulter to which a mole is attached, as that by revolving a key, or its equivalent, that restrains said coulter, and by advancing the plough, said coulter and mole will run out of the ground.

135. Apparatus for Supplying Hydro-carbon with Oxygen; A. H. Webster, Hudson, New York.

Claim—The bellows actuated by the tappit wheels and attached to the chest, provided with a cover or weight and an eduction opening, combined and arranged as set forth.

136. Bee-hives; Wm. L. West, Elmira, New York.

Claim—The use of the opposing springs for the purpose of insuring a contact of the parts contiguous to the passage way, as described.

137. APPARATUS FOR DRAWING WATER; Sylvanus A. Wheat, Franklin, New York.

Claim—Giving the barrel a longitudinal motion on the shaft, also connecting the valve to the rope by the rod.

138. ELLIPSOGRAPH; Thomas Williams and Wm. C. Joslin, Fisherville, Connecticut.

Claim—The slotted bar, A, provided with the slide, the arbor passing through the slide, with the disk and slotted bar, B, attached, and the elastic bar, G, pivoted to the bar, A, and connected eccentrically with the disk, the bar, B, having the pencil stock attached, arranged as set forth.

139. BURGLARS' ALARM; John P. Wilson, Frankfort, and John F. Thomas, Ilion, New York.

Claim—1st, The employment in connexion with the described gun alarm, of an adjustable gimlet screw, which is secured in a dovetailed groove in the body while in use, and which is secured in the barrel or bore by a screw when not in use. 2d, The employment of the two sides, between which the hammer falls, which serve to prevent particles of the cap from flying off, and at the same time forming a snug protection for the hammer, and causing a louder report of the cap.

140. ODOMETRE; Thomas K. Work, Hartford, Connecticut.

Claim—The curved or segment weight pivoted to the arm, which is attached to the pinion, and fitted between the annular ledges, as set forth.

141. INSTRUMENT FOR TAKING ALTITUDES OF THE SUN; Frederick Yeiser, Lexington, Kentucky.

Claim—The arrangement of the spirally slotted cylinder on a rotary frame, in such relation to a pin and to a strongly defined line, that it operates as specified. And in combination with the rotary frame, operating the cylinder by means of a toothed sector which gears into cogs, which are attached to the stationary disk, in the manner described.

142. MECHANISM FOR STOPPING WATCHES; John K. Bigelow, Assignor to Appleton, Tracy & Co., Waltham, Massachusetts.

Claim—The peculiar mode of making the ratchet, viz: with trapezoidal teeth, and with a notch in each of them. Also, the arrangement or application of the stop-lever with respect to the stopping stud and the ratchet, or so as to serve not only as a carrier and actuator of the former, but as a stop to the latter under circumstances as specified.

143. SEED DRILLS; Michael Boyer, Assignor to Charles S. Rohner and Wm. Gunckel, Germantown, Ohio.

Claim—Arranging the spring, ratchet wheel, ratchet, link, drag bar, arm, and discharge spout, in the manner specified.

144. STEAM CONDENSERS; John N. Dennison, Assignor to self, Joseph Dennison, and David Baker, Newark, New Jersey.

Claim—A feed-pump with its attachments and connexions, in combination with a condenser, arranged as set forth.

145. STUMP EXTRACTORS; E. B. Hall, Woodbury, Assignor to self and Joseph C. Farley, Pine Grove, N. J.

Claim—As an improvement on the patent of J. S. Wood, the cam, when constructed in the peculiar manner described, in combination with the rods and their rejective rollers and hooks, arranged in respect to each other for joint action, as set forth.

146. DIES FOR CUTTING SCREWS; Peter Hoffman, Rising Sun, Assignor to self and Samuel F. Covington, Indianapolis, Indiana.

Claim—The construction of a solid die, in which the bottom of the groove is so thrown up in the rear of the cutting point or edge of the same, as to avoid the friction occasioned by the rubbing upon the top of the thread, of the bolt cut or threaded.

147. KNIFE-SHARPENER; George Himman, Assignor to self and Charles Monson, New Haven, Connecticut.

Claim—The use of the two cutters when made susceptible of being adjusted to any desired angle, by means of a slot while using any portion of the length of the cutting edges. Also, the rest, in combination with the adjustable cutters, when the whole is constructed and fitted for use, as described.

148. SELF-ACTING CHEESE PRESS; William Leach, Clarkson, Assignor to self and George P. Tisdale, Chili, New York.

Claim—The pitman, arranged in combination with the pairs of cross-levers, so as to keep said cross-levers at equal heights at opposite ends of the press, and consequently at the same relative angle to the table in all positions, for the purpose of securing uniformity of pressure upon all parts of the articles pressed. Also, the combination of the rod, handle, and pawls, mounted in one pair of cross-levers, with the notches, or their equivalents, in the other pair of cross-levers, arranged in the manner set forth.

149. MOULDING PARAFFINE CANDLES; Horatio Leonard, Assignor to self and H. Ryder, New Bedford, Mass.

Claim—The process involving the employment of a heated mould, and water and air-baths at temperatures, and in the manner mentioned.

150. METHOD OF COVERING WITH FIBROUS MATERIAL SUBMERGED SPIRAL ELECTRODES FOR SHORT DISTANCES; Edward Maynard, Assignor to self, N. K. Slaughter, and Thomas E. Purdy, Brooklyn, New York.

Claim—Constructing submarine telegraph cables of metallic conductors, twisted in helical form, in combination with layers of cords or strings, parallel, or nearly so, with the axis of the cable, that are confined together, by serving or winding, and are saturated with water-proof non-conducting material, as set forth.

151. BOOT-JACK; L. J. Wicks, Assignor to self and T. Burbeck, Racine, Wisconsin.

Claim—The described boot-jack, with the tools formed on the rear or front of its arms, said arms being made to open or shut together, in the manner specified.

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152. BEE-HIVES; George C. Aiken, Nashua, New Hampshire.

Claim—The arrangement of the boxes in the hive, so as to form, with the case thereof, the auxiliary or bell glass chambers, as described.

153. TREATMENT OF HIDES AND SKINS; Joseph Armstrong, Woburn, Massachusetts.

Claim—In combination with the application and use of a press, in connexion with the impregnation of

the hide with grease by a peg-lined cylinder, or any equivalent means, the employment of scraps of hide or other suitable absorbents, in the press, and against the edges and other necessary parts of the hides, and so as, during the operation of the press, to absorb the liquor from such edge or parts on or in which it would be likely to remain.

154. ARRANGEMENT OF THE FEED ROLLER IN WOOD-PLANING MACHINES; H. H. Baker, New Market, N. J.

Claim—Arranging the feed roller with a vibrating shaft, box, slide, spring, and with necessary gearing, so that said roller may be kept to the work or moved out free from it without stopping the working or running parts of the machine.

155. HYDRANTS; Frederick H. Bartholomew, City of New York.

Claim—1st, The combination of the valve with the main valve and its fixed valve seat, arranged as described 2d, The arrangement of chamber within the trunk of the hydrant surrounding the seat of the main valve, having a waste passage at the bottom. 3d, The arrangement of the waste passage, the waste plug, and rod, in combination.

156. MOLE PLOUGH; Moses Bales, Big Plain, Ohio.

Claim—The adjustable mole ploughs upon a cutting shaft, arranged as set forth.

157. REEFING AND FURLING SAILS; Charles E. Bishop, Brooklyn, New York.

Claim—1st, The employment of supplementary sheets to the topsails, and other upper square sails of a vessel, in order that said sails may be kept more "flat," and that the strain upon the ends of the yard may be lessened. 2d, Constructing topsails with supplementary sheets, clew-lines, and leech ropes, and with a central tackle, by the employment of which in due order, the topsail may be reduced and secured in successive portions.

158. CARPET-STRETCHER; Isaac W. Bragg, Cincinnati, Ohio.

Claim—1st, The dog, operating to attach the stretcher to that part of the floor next the wall, toward which the carpet is to be stretched. 2d, The combination and arrangement of the trip-lever for disengaging the dog. 3d, The combination and arrangement of the apron, feet, and slides, operating in combination with the rake to prevent the teeth from grazing the floor. 4th, The combination and arrangement of the stock, dog, driver, and actuating worm.

159. METHOD OF OPERATING YIELDING FEED ROLLERS; Joseph H. Brinton, Westchester, Pennsylvania.

Claim—A pair of feed rolls, one of which is yielding, and both driven by the same screw shaft, and in gear with it at all times.

160. SKATES; Thomas W. Brown, Boston, Massachusetts.

Claim—The rocker and angular heel or straight edge runner, and applied to the bearing plates, or their equivalent, so as to be capable of being reversed with respect to the same, and used with either edge downward, as may be desirable. Also, the application of the heel plate to the heel screw, so as to be adjustable on, or with reference thereto.

161. STOVES; James D. Bruner, Alton, Illinois.

Claim—1st, Connecting and arranging with an oven which has no bottom, and between which and the passages of the products of combustion there is no communication, and the fire-box of the stove, air chambers, or cells. 2d, Combining with a detachable grate surface the detachable air cells or chambers.

162. INSTRUMENTS FOR THREADING NEEDLES; S. S. Burlingame, Warwick, Rhode Island.

Claim—The needle-threader, consisting of an internally-barbed elastic pronged fork.

163. CULTIVATOR TEETH; Wm. P. and Theodore H. Ford, Concord, New Hampshire.

Claim—The cultivator teeth, formed substantially as specified.

164. CUT-OFF VALVES FOR STEAM ENGINES; Adam Scott Cameron, City of New York.

Claim—The employment of the trip hinged valves, with their hook rods and appendages for operating them, or the equivalents thereof, in combination with the slide valve for cutting off the steam in steam engines. Also, in combination with the slide and the trip hinged valve, the so forming the seat of the slide valve relatively to the steam passages in the slide valve, as to admit the steam to the under face of the hinged valve and balance the pressure before they are opened. Also, in combination with the slide and trip hinge valves, the employment of the adjustable cone, or its equivalent, to regulate the period of cutting off the steam. Also, the cone, or its equivalent, in combination with the eccentric tube, or its equivalent, as a means of adjusting the relative periods of closing the two valves, as set forth.

165. HARVESTERS; Daniel Clow, Janesville, Wisconsin.

Claim—Constructing the main supporting wheel thereof, in such a manner as to form therein an outer and an inner zigzag groove; but this I only claim when the said grooves have differently proportioned reaches, and bear such a relation to the T-headed sliding bar, and the other parts of the machine which are connected with said bar and with the cutting apparatus, that the number of the movements imparted to the cutter bar can be varied at pleasure by shifting the bearings of the said sliding bar, from one position to another.

166. HAMES; Henry Cogswell, Greenwich, New York.

Claim—The application of the shifting slide to hames as they are now used, by means of which slide the point and position of the draft of the hames can be altered as desired.

167. PEN-HOLDER; Benjamin Cole, Brooklyn, New York.

Claim—The construction of a pen-holder with three or more elastic shanks or fingers, so arranged that the spring of said fingers will hold the pen by pressing it against and under the shoulders of two lateral fingers, and thus admit the introduction of, and be adapted to, pens of any ordinary size or thickness.

168. FIRE-PROOF FLOORS; John B. Connell, City of New York.

Claim—Constructing a fire-proof foundation upon a series of wooden girders, for the reception of a flooring surface formed of boards, or other suitable materials.

169. BREECH-LOADING FIRE ARM; Frederick Curtis, Saugus Centre, Massachusetts.

Claim—When a breech slide is used in connexion with the barrel of a fire arm, a movable breech, separate from the breech slide, and arranged and applied therein, so as to be adjustable to the rear end of the barrel. Also, the arrangement of the priming nipple and the touch-hole thereof, with respect to the movable adjustable breech applied to the breech slide, as specified, or with respect to the same, and a primer arranged in the stock, such arrangement being productive of advantages, as before-mentioned.

170. Railroad Car Springs; Augustus B. Davis, Philadelphia, Pennsylvania.

Claim—A spring composed of a box or casing, with a lid attached to the same by means of a bolt or bolts, the said box containing a number of spiral springs confined longitudinally between the bottom of the box and the lid, and retained in their proper position laterally by means of lugs, or other suitable devices, the said lid having a limited movement in the direction of the springs, but having no lateral movement independent of the box, so that each spiral spring may be independent of the other, although the whole act in combination, the entire spring thereby retaining its elasticity, even should one or more of its spiral springs be broken or damaged.

171. Shoe Lasts; John C. F. Deecken, City of New York.

Claim—The endless chain or band, in combination with a knife or knives, operated in the manner described.

172. Umbrella Fastenings; Charles DeSaxe, City of New York.

Claim—The arrangement of the bolt, operating without springs, and by a double or sliding and rotating motion, in combination with the tubes or sockets, for the purposes set forth.

173. Mode of Squeezing and Straightening Tobacco; Martin D. Elsom, Howardsville, Virginia.

Claim—Squeezing and straightening bundles of tobacco, with a view of their being afterwards "struck" by passing them through a straightening and compressing mechanism.

174. Churn; John U. Fiester, Winchester, Ohio.

Claim—The adjustable dasher, constructed with two blades, yoke spring, cross-tie, with slots and pins, together with holes and air cavities, operating as described.

175. Wrench; Daniel P. Foster, Shelburne Falls, Massachusetts.

Claim—Making the hinge joint between the stationary and movable jaw of the wrench at a, viz: by the projections on the stationary jaw, and the depression in the washer that is on the shank of the movable jaw, for the purpose of allowing the movable jaw to change its position in relation to the stationary one, as set forth.

176. Shackle of Telegraph Cables, &c.; George Gilmour, Chelsea, Massachusetts.

Claim—The telegraph cable or rope shackle, as constructed, with one or more jaws, and mechanism to operate the same. Also, combining either the wing or the knife, or both, with the shackle, so as to operate therewith in manner specified.

177. Cork-cutting Machine; George Hammer, Philadelphia, Pennsylvania.

Claim—The described arrangement of guiding rollers and sliding wedge, or their equivalents, in combination with the stop, constructed in the manner set forth.

178. Horse Power Equalizer; Gorges Hely, Laporte, Indiana.

Claim—1st, Connecting the eveners by a rope or chain that passes over a pulley at the centre of the shaft. 2d, In combination with the eveners, the method of connecting the points or parts to which the horses are hitched, and by which they draw, by means of a system of ropes or chains and pulleys connected with the draft bars.

179. Rotary Engine; Samuel Huse, Chicago, Illinois.

Claim—The cams with their steam and exhaust ports, in combination with the heads, pistons, and cylinder, operating in the manner set forth.

180. Method of Lighting Gas by Galvanic Electricity; W. W. Hopkins, Amelia, Ohio.

Claim—The arrangement and combination of the hollow permanent magnet, valve chamber, coil, electro-magnetic valve, and tube, as described.

[A gas burner is combined with an electro-magnetic seat in this invention, to control the letting-on and shutting-off the gas; and there is also a certain arrangement of the conducting wires of an electric circuit in which the electro-magnetic valve is placed, by which a piece of platinum constituting a part of the same circuit, and occupying a position over the burner, is caused to be heated by the same action by which the valve is opened, and so ignite the gas.]

181. Harvesters; Moses G. Hubbard, Penn Yan, New York.

Claim—Connecting the cutting apparatus with the machine by an adjustable attachment, which can be changed from a free hinge to a joint, rigid in one direction, or in both directions, for the purposes set forth. Also, the employment of a raising lever of the second order with a gradually increasing purchase, by which it is made self-sustaining. Also, keeping the lever in a convenient position for operation by the hand of a driver, by means of a spring.

182. Elevator for Window Sashes; Wm. Huey, Christiana, Pennsylvania.

Claim—The arrangement and combination of the rods, pawls, ratchets, loose drums, sliding shaft, pins, and cords, as described.

183. Apparatus for Compressing Elastic Fluids; John Jameson, Gateshead, County of Durham, England; patented in England, March 13, 1858.

Claim—The compression and expansion of aeriform fluids by an apparatus of the nature described, the same consisting of a combination and arrangement of a series of cylinders or vessels, perforated or tubular pistons, induction and connecting pipes, valves, a reservoir, a rotary shaft, and means of heating, or heating and cooling, the cylinders or vessels, in the manner described.

184. Tape Primer for Fire Arms; Theodore T. S. Laidley, U. S. Army.

Claim—The combination of two different materials in the manufacture of tape primers, one a metal, or like substance, to receive and protect the percussion powder, into which it can be firmly pressed, and the other to connect the former into a series, something that can be easily severed by the edge of the hammer.

185. Adjustable Sight for Fire Arms; Richard S. Lawrence, Hartford, Connecticut.

Claim—The application of said hinge joint to the spring base and elevator, constructed and arranged as described.

186. Burglar Alarm; G. A. Lilliendahl, City of New York.

Claim—The arrangement of the slide and plate with the lips, so that a cartridge placed on the slide and between the two lips is exploded by pushing the slide in.

187. Railroad Signal Lanterns; S. N. Lennon, Deposit, New York.

Claim—Suspending within the lantern, at two opposite sides, and over or behind the colorless glass plates, the frames, provided with the colored glass plates, and arranged as set forth.

188. Sewing Machines; Clark Marsh, New Milford, Connecticut.

Claim—The ring gauge with the pins, spring, and cam, or their equivalents, constructed and applied in combination with the slide ring, as set forth.

189. Preserve Cans; James F. Martin and Henry C. Nicholson, Mount Washington, Ohio.

Claim—A fruit or provision can, to be hermetically sealed, constructed of metal, lined on the inside with a vitrious enamel, capable of withstanding the action of the acids contained in the fruits, &c., to be preserved. Also, the combination of a metallic cover, vitriously enameled on the inside, with a fruit or provision can.

190. Stoves; David N. Martin, Lawrence, Massachusetts.

Claim—The arrangement of the air register at the upper part of the ascending discharge flue, and with respect to the direct damper, the ascending discharge flue being arranged between the two descending flues of the stove case.

191. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, A standard, arranged in the head of the frame work, and so constructed that it serves as a guide for the central vertical shaft, receptacle for gear, E, or gear, E′, or gear, E2, support and axis for the horizontal axle or shaft of the wind-wheel, and as a guide for the sliding thimble. 2d, Furnishing each of the stems of the sails with a cogged segment, for the purpose of revolving the sails on their radial axes, the segments being operated by cogged rack bars attached to the sliding thimble. 3d, The arrangement consisting of the main governor and the forked adjusting rod, connected with each other, for the purpose of operating the thimble in regulating or controlling the wind-wheel. 4th, Providing each of the stems of the sails with a weighted arm projecting forward of the front surface of the sails, for the purpose of governing the velocity of the wind-wheel by regulating the obliquity of the sails to the wind current. 5th, The covering made in two sections, which are constructed and arranged as shown, the tubular section revolving with the wind-wheel independently of section S, when the wind-wheel moves in the path of a vertical circle, and with it when the wind-wheel moves in a path of a horizontal circle.

192. Wind-mills; John M. May, Janesville, Wisconsin.

Claim—1st, The peculiarly constructed stationary, central, vertical shaft, in combination with the peculiarly constructed revolving tubular shaft or hollow column, the shaft providing axes for the wind-wheel, and the tubular column to revolve upon in the paths of horizontal circles, and serving as a support and guide of the structure of the wind-wheel, and the tubular column, serving for receiving the power of the wind-wheel and transmitting it to machinery. 2d, Enlarging the axle at its shoulder in the form of a hub or pipe-box, that the axis of the shaft may pass up directly through it, so that the centre of the axis of the shaft and axle intersect, and in themselves form vertical and horizontal centre bearings within the angle formed by the gear wheels, and the shaft and axle also serve as bearings for the gear wheels. 3d, The combination of a horizontal lever, the vertical governing rod or bar, guide bar, and thimble, on the tubular column. 4th, The employment of a revolving conical cover, for the purposes of protecting the mechanism of the wind-wheel, and dividing the wind current at the front and centre of the wind-wheel head, and guiding it upon the sails, and relieving the weighted elbow levers used for revolving the sails on their radial axis of the countervailing influence of the wind current, so as to enable them to act by centrifugal force with certainty in governing the velocity of the wind-wheel.

193. Cracker Machine; John McCollum, City of New York.

Claim—1st, In combination with the carrying apron, the roller, with its doffer, or the equivalent thereof, and the supporting or feed roller, and supporting table, or their substantial equivalents, in the combination the rollers and apron moving with simultaneous, intermittent, progressive motion, the whole being so arranged and operated as to progressively make flat pellets of dough suitable for crackers, ship biscuit, and similar articles, placed in proper order upon the apron, and at suitable distances from each other to permit of the extension of diameter resulting from the operation, as they pass under the roller, without materially disturbing the order of their arrangement on the apron. 2d, The reciprocating docker, in combination with the carrying apron, bed, and stationary perforated clearer plate, and with or without adjustable springs in combination therewith, to make yielding pressure at the docking point. 3d, The flatting apparatus, as set forth in the first claim, when combined with, or used in combination with, a docking apparatus, such as is set forth in the second claim, or the substantial equivalent thereof, when used, combined, and operated for the purpose of docking flatted pellets of dough for crackers as they are progressively brought to and under the docker from the flatting apparatus, without materially disturbing the order of their arrangement on the apron.

194. Dovetailing Machine; W. A. McDonald, Mott Haven, New York.

Claim—The cutter-head formed of a screw thread on a cylinder, the screw thread being provided with cutters, and arranged as described.

195. Printing Process; Gordon McKay, Boston, Massachusetts.

Claim—The combination of an impression cylinder and nippers, operating in conjunction with a blast pipe or mechanical means for producing an inequality of atmospheric pressure on the sheet when released by the nippers, and as said sheet is forced onwards by or with the impression cylinder in its rotary movement.

196. Repeating Fire Arm; Henry H. McKinney and Frederic Goth, Biddeford, Maine.

Claim—The combination of two strikers, one trigger, and a mechanism which will not only enable each striker to be set to and maintained at full cock, but by retraction of the trigger, will cause both strikers when at full cock, to be discharged or set free consecutively, so as to be forced against their respective nipples or the percussion caps, or the priming thereon, or the equivalents of such, and cause explosion of the priming of the charges in the order. Also, the specified application of the lock case with respect to the barrel, in combination with the construction and arrangement of the trigger-rod or slider in separate parts, and in such manner as to be capable of being locked together, and of being unlocked or disconnected under circumstances, as specified. Also, the application and arrangement of the two main springs of each striker in the lock case, as explained. Also, the combination of the trigger slide and the lever sears, arranged and operating with respect to the two strikers, as specified.

197. Cruets or Bottles for Castors; J. O. Mead, Philadelphia, Pennsylvania.

Claim—Constructing the cruets or bottles of cruet-stands, so that they may be adapted to each other and to the stand, as set forth.

198. PREVENTING FRICTION ON AXLES; T. S. Minniss and T. S. Minniss, Meadville, Pennsylvania.

Claim—The employment of sectors to avoid friction on rolling or sliding surfaces. Also, the combination of the shaft sectors and their adjusters, arranged as described.

199. WHEELS FOR RAILROAD CARRIAGES; A. R. Morrill, Northfield, Vermont.

Claim—A wheel for railroad purposes, having cast iron hub and rim, and a body of wood formed of double plates, and secured to the hub and rim by bolts, as set forth.

200. RETORTS FOR DISTILLING OILS FROM COAL; John Nicholson, Allegheny, Pennsylvania.

Claim—1st, Furnishing retorts used for extracting the oleaginous matter from coal and other substances with agitators, or a shaft or shafts, armed with agitators, as described. 2d, In so arranging the supply and discharge openings and the exit pipes in connexion with the trunnions, that when one portion of the retort is weakened by the action of the fire, another part may be exposed to it, as described.

201. MACHINE FOR MAKING BULLETS, &c.; Edward Nugent, Brooklyn, New York.

Claim—1st, The revolving self-cutting mould working in contact with the mouth of the lead kettle, through which the cavities are supplied with metal, in the manner set forth. 2d, The end motion of the two series of mould rings, and the opening and closing of the several rings in one series, while the cavities in the other series are being filled. 3d, The tumbling bars, or their equivalents, operating as described, by which a concussion is produced when the mould rings are opened, and allowance is made for any obstruction between the rings when closed.

202. CARPET-SWEEPER; N. B. Pratt, Deep River, Connecticut.

Claim—The arrangement of the rotating brush on adjustable swinging lever bearings, in combination with an elastic driving bolt, as set forth.

203. VULCANIZING CAOUTCHOUC; C. S. Putnam, City of New York.

Claim—The combination of the boiler, the vulcanizing chest, and the condensing chamber, constituting a portable automatic apparatus.

204. HARVESTERS; B. F. Ray, Baltimore, Maryland.

Claim—The conical roller, in combination with the cam groove for actuating the means that operate the cutter bar.

205. WINDLASS; Jesse Reed, Marshfield, Massachusetts.

Claim—The combination of the windlass drums, pawls, with the wheel, and knee or sampson post, whereby the central wheel is supported on both sides, and the windlass rendered more simple and sure in its action.

206. ROCKET MATCH-BOX; A. Roesler and Charles Frey, Warsaw, Illinois.

Claim—1st, The cylinders provided with strips and spring. 2d, The tool with spring, the whole being arranged as described.

207. LOCKS; A. A. Richards, Urbana, Ohio.

Claim—The arrangement of the wheels with their rings, and the spring and slides, for producing friction between them, and the arrangements of the bolts and its stems, and the use of the hands and dial, by which the principle of the above friction wheels and rings is applied to this lock. Also, the arrangement of the eccentric, brake, brake lever, check-bolt, and catch, by which the pressure of the stems on the rings simultaneously with the revolution of the hands and rings is prevented, as described. Further, the manner or arrangement above described, of revolving the dial by removing the screws, L L, as detailed.

208. STEAM ENGINE; Gelston Sanford, Poughkeepsie, New York.

Claim—The inside head, in combination with the cross-head and elongated cylinder, constructed in the manner specified.

209. MODE OF SEALING LETTERS, &c.; Joseph Saxton, Washington City, D. C.

Claim—The process of sealing, by means of fused metals or alloy, whereby the impression is made and the seal secured simultaneously.

210. MACHINE FOR PUNCHING RAILWAY BARS; George Shone, St. Louis, Missouri.

Claim—The arrangement and combination of the recessed gate, triple cam shaft, clamping screws, and adjustable buttons, as described.

[A sliding gate is fitted in a suitable framing, and provided with punches operated by means of cams and yokes; the punches work over a steel bolster, and the gate is recessed to receive the rail. By this arrangement rails can be punched at both sides simultaneously and very expeditiously.]

211. CONVERTING RECIPROCATING INTO ROTARY MOTION; E. A. Smead, Tioga, Pennsylvania.

Claim—The fly-wheel with the adjustable wrist-pin attached, in connexion with the slotted bar or rod, B, and rod, C, the whole being arranged as set forth.

[In this invention, there is an adjustable wrist-pin attached to a fly-wheel, and fitted within a slotted vibrating arm which has a rod pivoted to it at right angles; these parts are so arranged that rotary can be converted into reciprocating motion with the least possible absorption of power by friction.

212. METHOD OF BURNING THE THREADS ON WOODEN SCREWS; T. Briggs Smith, City of New York; patented in England, January 1, 1859.

Claim—The application of a screw made on a bung, and another screw made in the stave corresponding with that upon the bung, both being formed by burning; this bung is to be used for all casks or vessels made of wood for liquids. Also, forming a screw by burning on a bung or stopple, to be used in any vessel made of any material, whether wood, metal, glass, or other material.

213. FLY-TRAP; S. W. Smith, Brooklyn, New York, and Hubbard Bigelow, City of New York.

Claim—1st, The combination of the endless web or apron with the plate or scraper, and the rollers, as described. 2d, The combination of the endless web with the roller and the pan, in the manner described.

214. SEWING MACHINES; Watson Snyder, Newark, New Jersey.

Claim—The combination of the fixed lipper guide for the under edge of the binding, the fixed but adjustable guide for the edge of the folder of the binding, and the elastic plate operated upon by the pressure pad or foot, the whole applied as set forth.

215. DEFECATING AND CLARIFYING SACCHARINE JUICES; John Spangenberg, City of New York.

Claim—The application of hydrated oxide of tin, prepared with sulphurous acid, for the purpose of

decolorizing or bleaching and defecating syrups, saccharine solutions, and liquids from sugar cane, and other saccharine and vegetable juices, whether the same be used alone or in combination with aluminum.

216. CHURN; Oren Stoddard, Busti, New York.

Claim—The combination of the crutch with the interior of the churn-box, so that the lower end of the said crutch shall act as, and constitute the dasher.

217. MOP-HEAD; Luke Taylor, North Springfield, Vermont.

Claim—A mop-head, having a loose collar provided with a screw thread.

218. ICE TONGS; John Tyler, Providence, Rhode Island.

Claim—The combination of a pick and cutter, or either of them, with a pair of ice tongs, by forming or attaching the same upon or to the back of either leg of the tongs.

219. RAILROAD SIGNAL LANTERNS; J. L. Wager, Deposit, New York.

Claim—The lantern case provided with the colorless glass plates, and loosely attached or suspended to the rod or shaft, which is connected with the switch bar or lever; the case being provided with the oscillating or partially rotating frame, containing colored glass plates, and connected with the rod or shaft, by means of the arm, arranged as set forth.

220. CLOTHES FRAME; Lawrence B. Waterman, Chicago, Illinois.

Claim—The combination of the stationary top support with the movable parts, when operated through the segmental racks, and arranged for the purpose of forming a tipping clothes-dryer frame.

221. METHOD OF LOCKING AND SUPPORTING THE PANELS OF FIELD FENCES; Elisha West, Ogden, New York.

Claim—The combination of the panels and the triangular brace or jack, when so arranged in connexion with the recesses of the panels, that by drawing the adjacent panels in opposite directions till the jack shall enter said recesses, the sections of the fence shall be securely locked together.

222. COATING METALS WITH TIN; Carl Winzen, Albany, New York.

Claim—Subject to the explanations and disclaimer, the solution composed of the ingredients in substantially the same proportions applied to accomplish the process of tanning, and used substantially in the manner described.

223. SECURING GARMENTS TO HOOKS; Gilman Woodward and Franklin S. Hathaway, Keene, N. H.

Claim—1st, Securing the hook to the vertical sliding plate, in the manner described. 2d, The manner of operating the arm, in combination with the movement of the hook and sliding plate. 3d, Arming the hook and the arm at their points of contact with movable spurs, in a manner described. 4th, The tumbler, when operated as described, or otherwise to produce the same effect.

224. ELASTIC TOYS; Lucius P. Porter, Assignor to the New York Rubber Co., City of New York.

Claim—The combination of a reed, or other speaking device, with a hollow elastic toy made of caoutchouc or gutta-percha, or their compounds for acting together, the former by the latter. Further, the manner described of securing the reed frame to the toy by grooving the frame on its edges or periphery, and inserting it in a hole in the toy, so as to be clasped in the groove by the edges of the elastic material in which the receiving aperture is made.

225. CORN AND COB MILL; John De Frain, Assignor to Wm. Callahan and Wm. Grant, Philadelphia, Penna.

Claim—1st, Making the hopper of the crusher adjustable on the shell of the same, so as to present to the ear of corn either the corner edge of the hopper or the inner edge of the shell, as occasion may require. 2d, The carrier, the inverted cup, and its adjusting bolt and nut, and arch-piece, in combination with the hopper and spindle, arranged and operating together in the manner described. 3d, The combined arrangement of the scrapers on the bottom of the rotating disk, the annular groove in the diaphragm, and the outlet and tubes, operating together in the manner described. 4th, The combined arrangement consisting of the outlets and the opening through the diaphragm, operating together with the rotary disk, in the manner specified.

226. WASHING MACHINE; Thomas A. Dougdale, Richmond, Assignor to Wm. M. Reed, Newcastle, Indiana.

Claim—Combining and arranging the inclined planes, the plates, and pins, with the double-inverted inclined planes, rollers, and wash-boards, arranged as described.

227. PAILS; Josiah J. Dutcher, Brooklyn, New York, Assignor to Noah Mosher, Norwalk, Connecticut.

Claim—The pail, constructed of the body, A, and jacket, B, of the materials specified, to form a new and useful article of manufacture.

228. SHEET METAL ROOF; Ezra Pollard, Albany, New York, Assignor to self and Joshua Gray, Westfield, Massachusetts.

Claim—1st, Securing the edges of sheet metal coverings of roofs, and other portions of buildings, by means of strips of india rubber, united to the said edges by lap-joints, and nailed to the building. 2d, The interlocking metal strips, formed and applied as set forth.

229. CONVERTING RECTILINEAR INTO ROTARY MOTION; George W. Richardson and Robert Glover, Grayville, Illinois, Assignors to selves and John J. Tanquerry, White County, Indiana.

Claim—The arrangement of the rocking racks, in combination with the segment wheel, as described.

230. ROCKING HORSE; Arad Woodworth, 3d, Boston, and Daniel Woodworth, Warren, and M. T. Hitchcock, Springfield, Massachusetts, Assignors to Arad Woodworth, 3d, and Daniel Woodworth, aforesaid.

Claim—A rocking horse, consisting of the head and neck of a horse, made as in the ordinary rocking horse, combined with a hollow box or cradle, so that the child can be placed therein, and which rocks longitudinally, thereby uniting the advantages of a rocking horse and cradle, and preventing the liability of accidents to the child by falling.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On the Manufacture of the Uchatius Cast Steel.**

[Paper read at the Institution of Mechanical Engineers.]

The manufacture of cast steel, of which this paper treats, although not directly in the department of mechanical engineering, is so much connected with it, that a few words on that subject may be interesting to the members of the institution. The quality of the materials used for all parts of machinery and for the tools employed in their construction is of the greatest importance. These materials should possess the greatest strength and tenacity, and at the same time a durable and uniform wearing surface. Now cast steel perhaps beyond all other available metals possesses these qualities, and it is only its great cost that has hitherto prevented its more general application. It has a bearing strength of nearly three times that of the best forged iron, and having a perfectly uniform texture it wears equally; it must therefore be acknowledged that cast steel is the best material that can be used where lightness and strength are required, and for all parts of machinery that are subject to much wear and tear. Its great cost being the difficulty in the way of its extended application, the great object in view for some years past has been to find out some process of making cast steel of a good quality, and at a price that would allow of its free employment. Amongst a great number of metallurgists who have within a very recent period directed their attention to this subject, may be mentioned Bessemer, Chenot, Uchatius, and others. It is intended in this paper to enter only into the details of the Uchatius process of making cast steel, as compared with the ordinary processes at present in extensive use, which are two,—the English or converting process, and the German or puddling process.

To compare these processes with the Uchatius process about to be described, it must first be considered what steel really is, and in what manner it may be produced. This point may be illustrated by the following series, comprising the various degrees of wrought iron, steel, and cast iron, arranged according to the amount of carbon in each, beginning with the softest wrought iron, that is, with the iron containing no carbon, or the least amount of carbon :—

Soft wrought iron,	containing	0·0	per cent. of carbon.
Hard "	"	0·4	"
Soft steel,	"	0 5	"
Hard "	"	2·4	"
Cast iron,	"	2·5	"
Hard cast iron,	"	5·0	"

In this series, beginning with the softest wrought iron containing little or no carbon, the proportion of carbon increases until there is ½ per cent., which then forms soft steel; a further increase of carbon up to 2½ per cent. forms cast iron; and the proportion of carbon increasing to 5 per cent. gives the hardest cast iron. Hence it appears that

* From the Lond. Civ. Eng. and Arch. Journal, Jan., 1859.

the operation of steel making may be effected in two methods,—either by adding a certain amount of carbon to pure wrought iron; or conversely by taking away a certain amount of carbon from cast iron, removing at the same time the impurities of the cast iron.

The English or converting process is carried on according to the first of these methods, by adding a certain amount of carbon to wrought iron. The cast iron is first made into wrought iron, which is then converted into steel, forming blister steel; this is broken into small pieces and melted in crucibles, which renders it homogeneous, and is then poured while fluid into ingot moulds, after which it is known as cast steel. The chemical changes which the cast iron has undergone in this process are—firstly, when it was manufactured into wrought-iron all or nearly all the carbon was abstracted from it; and secondly, by the converting process a certain amount of carbon was restored to it; and finally, the steel thus produced was made homogeneous by melting and casting. It is evident that this is a very circuitous way of manufacturing cast steel, and it has the following disadvantages: the great loss of weight in manufacturing the cast iron into wrought, the difficulty in converting the wrought iron so as to carbonize it equally in all parts; the great length of time that this process requires for the production of cast steel, and the great cost of manufacture.

The German or puddling process is effected by the converse method, by taking away a certain amount of carbon from cast iron. The pig iron is puddled in the same way as in making wrought iron, except that the process is stopped when a certain amount of carbon has been taken away, a point which it is difficult to judge of. This partially puddled iron, so-called puddled steel, is then made homogeneous by melting it in crucibles in the ordinary way. The chemical change which the cast iron has undergone by this process is the abstraction of a portion of the carbon in the puddling furnace; and the puddled steel has then been rendered homogeneous by melting and casting. The disadvantages of this method are: the waste of iron by the puddling process; the uncertainty of getting equally discarbonized iron, owing to the difficulty of measuring the quantity of oxygen acting on the puddled metal; and also the cost of manufacture.

The Uchatius process is based upon the same principle as that last described, consisting in taking away as much carbon only as is required to produce steel, and removing at the same time the impurities of the cast iron. The first and most important of these objects is effected by bringing a certain measured quantity of oxygen, in the shape of oxides of iron, in contact with the cast iron, so that while the iron is hot the oxygen combines with the carbon and passes off in the form of carbonic acid gas. The purification of the cast iron from silica, sulphur, magnesia, &c., is effected by bringing the iron when it is in a melted state into contact with the alkaline earths, so that the impurities combine with them and remain floating on the top of the melted metal.

In order to effect these two operations at the same time the pig iron is first melted in a furnace or ordinary foundry cupola, and then run into a cold water tank, where it is reduced into small granules. The

mode in which the granulation is performed is stated to be as follows: the cold water tank has a horizontal wheel placed in it at one end, provided with wooden floats dipping below the surface of the water, and driven at a considerable speed; the melted metal running into the tank from the furnace falls on the wheel, which scatters it in a finely divided state towards the deep end of the tank, and it falls to the bottom in the form of small granules. This granulated cast iron is mixed with pulverized oxide of iron and some alkaline earths, and the whole put into the ordinary steel melting crucibles and placed in the furnaces and brought into a fluid state. The degree of hardness of the steel is thus capable of being regulated by the size of the granules and by the quantity of oxides used.

The chemical change which takes place in the crucible is as follows: Each granule being surrounded by the pulverized oxides, &c., the decarbonization takes place first on the outside of each granule, and so progresses towards the centre as the heat increases, the oxygen in the ores combining with the carbon in the granules and passing off as carbonic acid gas; if therefore during the process the granules could be examined, it would be found that the outside of each is entirely deprived of its carbon, the next portion partially decarbonized, and the centre not decarbonized at all; so that each granule would be composed of pure wrought iron, steel, and cast iron. By increasing the heat, the cast iron centre portion of the granule first becomes fluid, and the granule bursts and falls by its own weight to the bottom of the crucible. At the same time the earths mixed with the ores melt and rise to the top, forming a layer of scoria or dross floating on the surface of the melted iron. Each granule of melted metal has therefore in falling to pass through the rising scoria; and it is in the passing through that the combination of the impurities of the metal with the alkaline earths takes place, so that the decarbonized iron on reaching the bottom of the crucible is cleansed from all impurities. The heat continuing to increase melts the outside portions of the granules, and the whole is reduced to one homogeneous fluid mass in the crucible, which is then ready for being poured into the ingot mould. The iron contained in the oxides mixes at the same time with the fluid mass, and yields about 6 per cent. more of cast steel than the weight of granules put into the crucible.

The oxides employed in this process are iron ores of the finest quality, such as spathose and hematite, which are previously calcined and pulverized. The proportion of the oxide to the granulated iron is according to the hardness of steel required, say from 20 to 30 per cent.; the greater the quantity of the oxide employed, the greater the decarbonization, and consequently the softer will be the steel produced.

The process is attended with the following advantages:—A rapid manufacture of cast steel, the pig iron being turned into cast steel in the space of a few hours; certainty in producing a uniform quality of steel, that is, steel containing a determinate proportion of carbon, which is accurately determined beforehand by the weight of oxide mixed with the granulated iron; and less cost than the ordinary me-

thods of making cast steel, since the processes are fewer and the materials used are simply pig iron and iron ores.

Some experiments in making cast steel by the Uchatius process have been made by the writer at the Newburn Steel Works, near Newcastle-on-Tyne, from which it appears there is little doubt that a very fine quality of cast steel can be produced at a cost little more than one-half of that entailed by the common processes.

A specimen of steel bar was shown made by the process described in the paper, which had been tested and broke with a load of 30 cwt. at the centre, the bar being 1 inch square and 3 feet in length between the bearings; the deflection was $3\frac{3}{4}$ inches at the time of breaking. A specimen was also exhibited showing the welding of the two pieces of the steel, and specimens of the granulated iron and the pulverized ore used in the manufacture, and of the bars and plates produced, with some volute springs made from the steel; also a piece of the steel twisted cold to show its toughness.

Mr. T. SPENCER said that he had not tested the tensile strength of the steel at present, but found it stood well in the volute springs that had been made of it, which had proved quite satisfactory in working. Only some small plates had been rolled from the steel at present as a trial, but these had proved quite satisfactory; and he did not anticipate any difficulty in making any size required. It would be observed in the specimen exhibited, that the plate was quite sound on the edges, although it had not been rolled edgeways, but simply rolled down lengthways. No wire had yet been made from it; the bars and plates made had been hammered and rolled down from the ingots of cast steel. The total cost of the finished bars was about one-half of that by the ordinary process; but where the makers hammered and rolled their own steel, and the cost of the ingot only had to be compared, the proportion would be considerably less.

Mr. W. FAIRBAIRN thought this process was a very important step in steel manufacture, and would prove of great advantage in the construction of machinery, if a sound uniform steel could be obtained at a moderate price. The bar of the new cast steel that was exhibited certainly showed great strength, having sustained nearly three times as great a weight as iron; and he thought in process of time they might reasonably expect to obtain plates cast and rolled of that manufacture at least double the strength of the present wrought iron boiler plates for the same thickness, and not much more expensive for the same strength; and it had now become a very important desideratum to get plates for boilers only half the thickness at present used, as the thinner plates were so much less liable to injury from overheating and unsoundness in manufacture.

Mr. T. S. PRIDEAUX thought the dropping of the melted iron into water in the process of ganulating it would have a beneficial effect in assisting to free the metal from sulphur, by the metal coming in contact with water in a red hot state; the plan had been tried in Austria, he believed, with success. It was not at all easy to separate sul-

phur from iron by simple exposure to oxygen in atmospheric air; and he thought the plunging of the highly-heated granules in water would be the means of removing the sulphur to a considerable extent from the iron.

Mr. W. Smith thought the process that had been tried in Austria was that of Capt. Uchatius now described; the plan of granulation seemed a very ingenious and important step towards obtaining steel by the direct process of decarbonizing, and offered the best chance of carrying that process to a successful and economical result. Great advances were being made at the present time in steel manufacture, and they were doubtless greatly indebted for these advances to the investigation of the subject that had been excited by the publication of Mr. Bessemer's plans, although he had not succeeded in all that he had attempted himself; and they were also much indebted to Mr. Binks for having called more minute attention to the chemical principles involved in the manufacture of steel. The new process described in the paper appeared to have effected a great success in obtaining cast steel by the direct process; and if the uniformity of quality could be maintained, the economy of manufacture would allow of the use of cast steel being extended to many important new applications, such as boiler plates, and steel wire for the manufacture of telegraph cables.

Mr. A. Lenz explained respecting the process, in the absence of Capt. Uchatius, that the only object in dropping the melted iron into water was to effect its granulation, and not for the purpose of depriving it of sulphur. The process of this manufacture of steel was to decarbonize the cast iron by the action of oxides under a high temperature, the great object being to expose the largest possible surface of the iron to this action, and by granulation this object was obtained to a remarkable extent. As to the actual composition of the steel, Capt. Uchatius had come to the conclusion, from the results of his observations, that the best steel required some small portion of what are considered impurities, such as sulphur, silica, &c.; and that chemically pure steel was not the result to be aimed at, and he had found that even with $\frac{1}{4}$ per cent. of sulphur the steel was of good quality. The great desideratum was to make steel at a very cheap price; and he had hopes it might even be practicable to apply it ultimately to the manufacture of railway bars.

Mr. J. Anderson observed that the first steps had certainly been accomplished towards obtaining a better material at a reduced cost, and this was a very important object to be aimed at. Mr. Binks had been the first to draw attention to the fact of steel containing nitrogen, which from his researches appeared to be an ingredient of great importance in the composition of the different qualities of steel, and he was not aware whether any further information had been obtained upon this point.

Mr. E. A. Cowper remarked that, in the list of compounds of carbon and iron given in the paper, the hard cast iron was put down as having the largest proportion of carbon; but he supposed it was not meant that the hardest cast iron was that containing the most carbon,

as the extreme of soft grey iron was kishy from an excess of carbon. He asked whether the Uchatius process removed the phosphorus from the iron; and what were the results of Chenot's process, by which a spongy mass of iron was produced, which was then compressed and dipped into oil, converted and worked into bars.

Mr. A. LENZ said that only the good qualities of iron were attempted to be used for steel-making by the Uchatius process, and the Indian and Swedish iron was principally used, containing very little trace of phosphorus, as it was doubtful whether any phosphorus could be removed in the process.

In Chenot's process the principle was to employ pure magnetic iron ore in powder, which was found in a few situations in the Pyrenees in a natural state of powder, and was separated by a machine from the earths mixed with it. This powder was put into a furnace like a cupola, within a tube in the centre protecting the ore from the fuel, and exposed to a great heat; the powder then became in a spongy state, by reduction to nearly pure iron, but was not able to melt. It was then compressed cold with great force under a hydraulic press to solidify the mass, and was finally carbonized by covering the mixtures of oils and other carbonaceous substances, and melted in a close crucible. He doubted the process being adapted for the actual manufacture of steel on any large scale, and thought it more suitable for the laboratory than the shop; various articles have been made of the steel for trial, which he believed were of a good quality, although he thought there was not any regular manufacture carried on.

Mr. W. FAIRBAIRN had seen the process in operation two years since in Paris, and the steel that was manufactured by that means was of good quality; but the process was carried out only on a small scale, and seemed scarcely suitable for any wholesale manufacture.

Mr. T. SPENCER observed that a magnetic machine was employed to separate the iron from the earthy matter, when in the state of powder as found naturally. The pig iron was broken into 6 or 8 inch pieces, and was at first put into the cupola for melting in the ordinary way; but they had now constructed a furnace for the purpose, as the ordinary cupola rather increased the proportion of sulphur in the metal by absorbing some from the fuel; the new furnace was a kind of reverberatory furnace, melting the iron in a chamber separate from the fire. The fluid metal was then run into the granulating tank; and the granules of iron were collected at the bottom of the tank by drawing off the water.

De-odorizing Alcohol.

In trying to prepare a transparent soap, M. Kletzinsky has made a curious observation which may be of value in the arts; he found that empyreumatic alcohols distilled over properly selected soaps lost their bad odor and their bad taste. A series of experiments resulting from this first observation lead to the following results:—

1. Spirits of wine, brandy, or alcohol distilled over soap lose their

empyreumatic odors and tastes entirely. About 212° the soap retains neither alcohol nor wood-spirit.

2. The empyreumatic oil which remains in combination with the soap which forms the residuum of the distillation, is carried off at a higher temperature by the vapor of water which is formed during a second distillation, the product of which is a soap free from empyreuma and fit to be used again for similar purposes.

3. The concentration of the alcohol increases in this operation more than when soap is not employed, because this compound retains the water, and the alcoholic vapors which pass over are richer.

4. 33 lbs. of soap is enough for 100 gallons of empyreumatic brandy, and direct experiments have shown that under the most favorable circumstances, the soap can retain 20 per cent. of empyreumatic oil.

5. The soap employed should contain no potassa; it must be a hard or soda-soap, and ought to be completely free from any excess of fat-acids or fluids, otherwise it may render the product rancid and impure. Common soap made with oleine and soda by the manufacturers of stearine-candles has satisfied all the conditions in practice. If this soap is employed, it will be better to add a little soda during the first distillation.

The hard soda-soaps, as exempt as possible from fluid fat-acids, remove completely the empyreumatic odor, and act, for equal weights, much better than any of the other modes heretofore proposed, which disguise rather than correct the fault.

For the Journal of the Franklin Institute.

METALLURGICAL NOTES, NUMBER I.

Manufacture of the Oxide of Zinc near Lancaster, Pennsylvania.

By W. J. Taylor.

The occurrence of sulphate of zinc in the oxide of zinc of commerce, such as is used as a paint, has not, to my knowledge, ever been noticed. It may not be uninteresting to metallurgists and chemists to mention such occurrence; the quantity of sulphuric acid found by analysis in the oxide of zinc, the process used in the manufacture, and the ore from which it was obtained; also, to mention some of the objectionable properties which were attributed to the presence of the sulphuric acid.

The article in question was made at *temporary* works for the manufacture of zinc oxide near Lancaster, Pennsylvania; temporary works as being evidently designed by the originators of the company (which was organized for the purpose of mining the ore and manufacturing the oxide,) to last only until a favorable opportunity would offer to enable them to sell their stock.

It will first be necessary to describe the ore of the mine, and to do this properly it will be advisable to mention a little about the mine and its geological position. The ore occurs in a blue magnesian lime-

stone of the lower silurian system; there appeared to be two layers of the zinc ores, which were divided by a layer of the dolomite; but this was most probably only an appearance, as the layers evidently united at a comparatively slight depth. The deposit is situated in a valley and dipped north at an angle of thirty-two degrees; between the dolomite and the lower layer of zinc ore, was a seam of galena from two to three inches in thickness, which frequently diminished to a mere thread. Carefully selected specimens of this galena contained about an ounce of silver to the ton (2000 pounds). On this slight appearance, the mine was formerly worked as a lead mine. The mass of the zinc ore of both layers was blende, which was mixed intimately through the dolomite in a way peculiar to this locality. The zinc blende had decomposed near the surface and a carbonate of zinc resulted, with very small portions of electric calamine (silicate of zinc). The mine being in a valley, water was reached at a short distance, and below this, the ore was entirely the sulphuret of zinc.

It was advised before erecting the works to explore the locality more fully, in order to find whether more of the carbonate existed, but such advice was disregarded, and metallurgical works were erected.

The carbonate which had previously been extracted in the explorations for the lead, was first used in the furnaces, and a superior quality of oxide of zinc was made from it; but this ore was soon exhausted, (there never was more than about two hundred tons of the carbonate of zinc taken from the mine,) and as a last resort, the zinc blende was used. It was surmised that from the peculiar mechanical mixture of the blende with the magnesian limestone, that at a high heat a double decomposition might result; oxide of zinc being formed, and the sulphurous vapors uniting with the lime and magnesia form sulphurets of calcium and magnesium, which would remain with the slag.

This very pretty theory unfortunately was not entirely verified by actual experiments. Large quantities of sulphurous acid gas was evolved, and in addition, sulphuric acid was formed, which united with the oxide of zinc. The sulphate of zinc resulting, though in small quantities in the oxide, prevented this latter from being ground with oil, advantageously, so that the manufactured article, which, from its appearance and the known quality of the oxide manufactured from the pure carbonate was readily sold by sample, after trial was returned as useless for the purposes of grinding in oil as a pigment, the complaint principally was that it was too great an absorbent.

No. 1 contained—

Sulphuret of zinc,	45·34	per cent.
Carbonate of lime,	26·80	"
Carbonate of magnesia,	14·88	"
Carbonate of iron,	5·04	"
Silica,	5·43	"
Water and loss,	2·51	"
	100·00	

[45·34 per cent. of sulphuret of zinc yields 36·73 per cent. of oxide of zinc.]

This ore, as will be at once seen from the above analysis, was zinc blende mechanically mixed with magnesian limestone. At the closing operations at this mine and at the lowest of the workings, an average sample gave on analysis not more than 8 per cent. of the oxide of zinc.

No. 2 contained—

Carbonate of zinc,	78·70 per cent.
Carbonate of lime,	12·64 "
Carbonate of magnesia,	2·62 "
Sesqui-oxide of iron,	2·32 "
Silica,	2·36 "
Water and loss,	1·36 "
	100·00

[78·70 per cent. of carbonate of zinc yields 51·00 per cent. of oxide of zinc.]

This ore, as has been mentioned, was the result of the decomposition of the blende, above water level and to the depth at which atmospheric agencies had penetrated.

No. 3.—Is the result of analysis of a sample of the oxide of zinc manufactured from zinc blende composition shown by No. 1.

Oxide of zinc,	78·07 per cent.
Sulphuric acid,	4·60 "
Water,	15·00 "
Sulphate of lead and quartz,	2·77 "
	100·44

As there has been but little published regarding the processes used in the United States for the manufacture of the oxide of zinc, a little sketch may not here be uninteresting.

The process used at the Lancaster works was generally the same as that used at the Lehigh works; indeed, there is but little difference even in the works at Bergen Hill and at Newark, New Jersey; with the exception that at the two latter named places, a variety of reverberatory furnace was used in place of the superior one patented by Samuel Wetherill, Esq., of Bethlehem, Pennsylvania; though I believe Mr. Wetherill's furnace is now used at Bergen Hill works.

The Wetherill furnace consists of a semi-circular arch of fire-brick turned over a hearth of perforated grate bars, with a tight ash-pit beneath, into which a steady blast is blown, which diffuses itself beneath the entire fire surface through the perforations in the bars, which are filled with holes not greater than a quarter of an inch in diameter.

These grate bars are about two feet long by about five or six inches in width; two lengths being the width of one furnace. The perforations are conical, being the smallest at the top. The front of the furnace is closed excepting a door-way about eighteen inches square. The oxide of zinc volatilized, passes through openings in the top of the furnace arch, which connect by short iron vertical pipes with a large horizontal conducting pipe, which serve for a "bank" of furnaces; for the furnaces are built in banks of a dozen or more. A strong draft caused by a large fan blower draws the oxide as it is volatilized from

the furnaces through this same blower, which forces it into brick buildings or houses, where it passes in at the bottom and out at the top, and by this passage deposits the heavier particles of ashes or little impurities which the draft carried from the furnaces; the vapor passes out the top of this brick building into another built a short distance from it filled with immense muslin sacks, through which the vapor of zinc is filtered, the cotton fabric prevents the passage of the oxide of zinc, but does not hinder in the least degree the escape of the coal gas. These cotton bags require to be shaken constantly during the day, the pores of the muslin becoming so coated with the oxide of zinc as to prevent the escape of the coal gas. They are generally arranged with vertical appendages, into which the oxide falls, and is removed from time to time. These muslin filters were invented by Mr. Richard Jones, of New Jersey, several years since.

The furnaces are charged with the pulverized ore, mixed with about 33 per cent. of fine coal, a fire being started on the grate bars before the charge is added.

Artificial India Rubber.

We take from the Proceedings of the Academy of Sciences of Paris, the two following communications, in the hope that they may prove useful in our arts:—

On the Action of Chloride of Sulphur upon Oils. By M. Z. Roussin.

If a vegetable oil be mixed with about $\frac{1}{30}$ of its bulk of chloride of sulphur, this latter substance will be entirely dissolved; in a little while the mixture heats and assumes a viscous consistence, so that frequently the vessel may be inverted without spilling the contents.

If the chloride of sulphur is in the proportion of $\frac{1}{10}$, the preceding phenomena acquire greater intensity. The mixture soon attains a temperature of 120° or 140° Fah., some bubbles of hydrochloric acid are disengaged, and the whole mass solidifies instantaneously without losing its transparency, and acquires a consistence like caoutchouc. This product possesses some elasticity and shrinks slightly after consolidation. Macerated in distilled water it loses its transparency and becomes opaque white. In a few days it is transformed into a white, slightly friable, elastic mass, having no similarity to the original substance, and resembling rather an organic substance.

If we take a mixture of one part of chloride of sulphur, and nine of oil, and heat the mixture, we shall find that at about 140° a pretty strong re-action shows itself. Hydrochloric acid is disengaged, and the mass is transformed into an elastic cavernous substance like sponge, very closely resembling certain cryptogamic vegetations. Macerated in water, it becomes whiter without changing its form.

All these products resist the action of boiling alkalies, whether dilute or concentrated. Ammonia and the concentrated acids have no action on them. Neither water, alcohol, ether, sulphuret of carbon, or the oils appear to alter or dissolve them.

At the temperature of 300° Fah. they remain solid and unaltered. A few degrees above this point they begin to melt into a brown liquid and emit whitish acid vapors. We have not had time to determine the composition of these substances. After long boiling in alkaline solutions, reiterated washings with dilute acid and boiling water, they still contain sulphur and chlorine in considerable quantities. In this state, the slightest shaking communicates to them a peculiar vermicular motion, which continues for some time.

Action of Chloride of Sulphur on Oils or Vulcanization of Oils.
By M. PERRA.

The chloride of sulphur combines at ordinary temperatures with flaxseed oil as well as with other oils.

If we take 100 parts of flaxseed oil and about 25 parts of chloride of sulphur, we obtain a compound which has the maximum hardness.

100 parts of the oil and from 15 to 20 of the chloride give a flexible compound.

From 5 to 10 parts of the chloride will thicken 100 parts of the oil very strongly without hardening it. In this state it is soluble in all the solvents of common oils. This is not the case with the other combinations, which swell somewhat, and lose a little sulphur without dissolving in solvents.

If we dilute a given weight of flaxseed oil with 30 or 40 times its weight of sulphuret of carbon, and introduce one-fourth of the weight of the oil of chloride of sulphur, we have a product which will remain liquid for some days. If in this condition it be applied upon glass or wood, &c., the sulphuret of carbon evaporates and you have instantly a varnish.

The chloride of sulphur saturated with sulphur is preferable for these actions, to that which is not saturated.

In making these mixtures, proceed as follows:—Introduce the chloride of sulphur quickly into the oil, which must be stirred so as to mix them intimately. Gradually the mass heats, the combination takes place, the oil thickens, and forms a compound more or less soft according to the proportions of the chloride. But small quantities should be operated on at a time, and all elevation of temperature must be avoided, otherwise the chloride of sulphur will be volatilized, and will form bubbles in the mass, or carbonize and blacken the oil. As soon as these two substances are intimately mixed, pour the mixture on a plate of glass or other polished substance, smooth it, and in five or six minutes, according to the temperature of the air, you obtain the compound. With the point of a knife detach one of the corners of this pellicle, which may easily be raised without breaking. One coat may be laid over another, and they will unite in one, provided the upper one be put on after the temperature of the lower has been reduced; moisture in the air must also be avoided, which decomposes the chloride and prevents the adherence.

By following this mode, I have succeeded in making little boxes, knife-handles, &c. By introducing wire gauze into the mixture, plates of considerable resistance may be procured. This is easily done by laying the wire gauze on the glass and proceeding as above.

All the products thus made, are completely transparent, if care be taken to keep the articles in a stove or other warm place to drive out the vapors of chloride of sulphur, and prevent the dampness from decomposing this compound. These hard compounds of oil are not attacked by any atmospheric influences; I have left them for several years exposed to the external air.

These compounds are not, like vulcanized india rubber, flexible when cold, but are brittle when handled carelessly, which is an inconvenience. A still greater one is the decided smell which they retain for a long time.

I have tried to make them as hard as hardened india rubber, but in vain. Almost all substances introduced into them are altered by the chloride, and add nothing to the hardness.

They can, however, easily be colored. It requires but a little color mixed with the oil before the introduction of the chloride. Some colors, however, are altered by it.

These compounds resist very well the mineral acids and alkalies when moderately dilute. These alkalies concentrated saponify them finally. A heat of 250° browns them, a higher temperature melts them with a blackish color. This vulcanized oil may be well used for moulds, as it takes impressions very sharply. When rubbed, it always keeps a smooth and polished surface. It has electric properties in a high degree, and might be used for plates for electric-machines.

I have not been able to apply this substance upon stuffs, in consequence of its acid reaction, which destroys them. I have plated wood with it, by first roughening the wood so as to cause it to adhere. It may be applied for floor-cloths, table-covers, imitation marbles, window panes, &c.

I will remark, in conclusion, that the bromide of sulphur has the same properties as the chloride, and it was, in fact, with the former that I made my first experiments at the College of France, in 1853.

For the Journal of the Franklin Institute.

Use of Carbon for Dusting Moulds for Casting Metals.

By W. J. Taylor.

In the February number of the *Journal of the Franklin Institute*, is a notice of a recent English patent for the dusting or coating the inside of sand moulds for iron castings, with pulverized carbon which is free from bituminous matter. This may possibly be new in old England, and doubtless is considered by the worthy officials of the circumlocution office as requiring special protection; the process is, however, quite an old one in the United States, and is here so universally known

that it will not be possible to find a furnace or foundry in the country where pulverized charcoal or anthracite is not used or has not been in use. I believe that in some foundries a chemical compound is now used, one of the principal components of which is probably carbon.

New Dividing Engine. By M. Froment.

M. Froment requested from the Academy of Sciences of Paris, an examination by a committee of his mode of dividing astronomical instruments. This mode is not of recent invention, but has been in daily use by M. Froment for a long time, and has been shown to many of the members of the Academy. Respect for the memory of the late M. Gambey, and a fear of injuring the interests of the heirs of this illustrious mechanic, have alone retarded the official presentation of this process of incomparable exactness. After, however, the presentation by M. Guillemot of means for the same end, M. Froment feels that he has the right to take public possession of his own discovery.

The processes employed for the division of circles and of straight lines are analogous; let us therefore suppose that we are describing one of the latter kind, the principal organ of which is a screw with a thread of 1 mm. (0·04 inch).

Upon the chariot which carries the tracer is placed a metallic rule, on which are traced two fine lines, the arbitrary distance of which apart (d) must remain the same during each experiment.

The chariot being brought to its starting point, a microscope upon the table of the machine is brought exactly over one of the marks, and the number of turns and fractions of a turn (n) of the screw noted, which are required to bring the second line under it; that is, to advance the chariot through the space d.

The microscope is then moved to correspond again with the front line; and the observation repeated again and again until the chariot has advanced the whole length of the screw; and thus the number of turns corresponding to an equal length at different parts of the screw is determined. These differences may be read either upon the head of the screw, or on a filar micrometer in the microscope, or by means of a comparing lever, &c.

By repeating these operations with properly chosen values of d, we get to know the condition of the screw at all its points.

Upon a band of metal a curve is then traced, whose abscissas represent the successive quantities by which the chariot must advance when dividing; and whose ordinates have lengths proportional to the variations of the screw thread determined as shown above; and as these variations are ordinarily small fractions of a millimetre, they are represented by ordinates some hundreds of times larger.

The band of metal is then cut out along the profile of the curve, and adjusted in a groove so as to move with the dividing chariot.

A little roller whose centre is restricted to move in the plane of the

curve, and perpendicularly to the abscissas, rests on the curve. As the curve advances it obliges this roller to rise or fall according to the ordinates which it meets, that is, proportionally to the errors to be corrected; but with a motion much greater than the errors, an important point in the method, since it permits us to neglect certain inaccuracies in the execution of the curve and of the pieces moved by it.

Then by reducing the motion of the roller by means of levers or their equivalents, we easily communicate to the tracer a motion equal and in a contrary direction to the errors of the screw at different points of its length, and consequently we divide by the machine as if the screw was perfectly uniform.

In place of communicating to the tracer the slight displacement which we have explained, we might apply it equally well to the screw itself, by acting on the piece against which the screw rests.

A third means of correction consists in communicating the motion of the roller to the system of stops generally employed to limit the angle through which the screw turns at each division traced by the machine; this angle being thus increased or diminished at each instant by quantities corresponding to the irregularities of the thread, it will result that the nut and the attached chariot will move regularly.

The same means are applied in a similar way to the machines for dividing circumferences, which generally consist of a circular platform whose circumference is toothed and moved by an endless screw.

To determine the errors, an arbitrary arc is taken, whose extremities are marked by fine lines, which are brought successively under the microscope which is displaced around the circumference, so as to engage the screw in different parts of the rack. The curve is traced by polar co-ordinates upon a disc which has the same angular motion as the principal platform, and the roller is moved by either of the methods mentioned above. These three methods employed for several years upon different machines, have given equally satisfactory results.

To complete the above explanation, I would add, that instead of seeking to determine at once in great detail, the errors of the machine, for the purpose of applying definitive corrections, it is better to begin by an approximate determination, which gives a provisional curve and produces a considerable amelioration in the machine. By a new study of it in this state, we are led to corrections of the second order, which may be followed by those of a third; but in almost every case, the second are sufficient to attain the limits of accuracy belonging to the kind of correction which we are considering.

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Remarks.—We understand that the machine used by Messrs. Darling & Schwartz, of Bangor, Maine, for dividing the rules to which first premiums have been awarded at two successive Exhibitions of the Franklin Institute, combines the same leading idea, as the very ingenious machine here described by M. Froment. *Ed. Jour. Fr. Inst.*

Copying Drawings by Galvanism.

Marshal Vaillant described to the Academy of Sciences of Paris a mode of copying drawings devised by M. Defrance, and perfected by Colonel Levret. The process is as follows:—

The drawing is made on transparent paper, and is laid, face downward, upon a board, and fixed by tacks. Coats of gelatine are then applied with a brush to the back of the drawing so as to obtain a sheet of gelatine from $\frac{1}{100}$ to $\frac{1}{80}$ inch thick. Upon this gelatine the drawing is traced with a simple point. A solution of gutta-percha in sulphuret of carbon is then applied with a pencil, and the coatings repeated until it has also assumed a thickness of about $\frac{1}{100}$ of an inch. This will require at least thirty coats. When the gutta-percha is sufficiently dry, a plate of copper is laid on it to give it stiffness. The whole is then turned up, and the original drawing exposed. This is easily removed, and then by delicate touches of a sponge dipped in water, the gelatine is separated from the gutta-percha, which is metalized by black lead. The plate is then electrotyped as usual.

The Marshal, (who is Minister of War,) declares that by applying this process to the six-sheet map of Kabylie, they have obtained an economy of seven-eighths of the time, and of six-sevenths of the expense.

Acad. of Sciences of Paris, Nov. 19, 1858.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, March 17, 1859.

John C. Cresson, President, in the chair.
John Agnew, Vice President, } Present.
I. B. Garrigues, Recording Secretary, }

The minutes of the last meeting were read and approved.

Donations to the Library were received from Prof. A. D. Bache, Washington, D. C.; the Board of Water Commissioners, Detroit, Michigan; Young Men's Mercantile Library Association, Cincinnati, Ohio; Prof. Joseph Lovering, Cambridge, Mass; Cornelius A. Walborn, Pennsylvania Legislature; and Dr. T. S. Kirkbride, Professors John F. Frazer, John C. Cresson, and B. Howard Rand, H. P. M. Birkinbine, Esq., John E. Addicks, Esq., and Philip Price, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement for February, was read.

The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported that they had organized for the present year by electing Robert Cornelius, Chairman, and Messrs.

Isaac S. Williams and James H. Bryson, Curators, and appointed the following Standing Committees:

On Publications.	*On Instruction.*	*Managers Sinking Fund and Finance.*
John C. Cresson,	John F. Frazer,	Frederick Fraley,
B. H. Bartol,	Frederick Fraley,	Samuel V. Merrick,
J. V. Merrick,	Isaac B. Garrigues,	Evans Rogers,
Fairman Rogers,	Alan Wood,	John F. Frazer,
Washington Jones,	George Erety,	Joseph Harrison,
	Lawrence Johnson,	George Erety.

The stated meetings to be held on the second Wednesday evening of each month.

The Actuary reported that the following Standing Committees have organized by electing their chairman, and appointing their times of meeting:

Committees.	*Chairman.*	*Meetings.*
On the Library,	Henry K. Plumley,	1st Tuesday evening.
" Exhibitions,	John E. Addicks,	1st Thursday afternoon.
" Arts and Manufactures,	David M. Hogan,	1st Friday evening.
" Minerals,	John C. Trautwine,	2d Monday "
" Science and the Arts,	John C. Cresson,	2d Thursday "
" Meetings,	Washington Jones,	Monday previous to 3d Thursday.

Candidates for membership in the Institute (3) were proposed, and the candidate proposed at the last meeting (1) was duly elected.

Dr. Rand exhibited two stereoscopic photographs on glass of the surface of the moon, taken by Mr. L. M. Rutherford of New York; also, a number of single pictures on paper of the same; also, a series of large photographs of the experimental steamer built by Messrs. Winans of Baltimore.

Dr. Rand exhibited a new design for valve gear, by S. L. Wiegand. It has been submitted to the Committee on Science and Art for an examination and report, which when made may be found in the proceedings of that Committee.

Mr. D. R. Pratt exhibited and explained the model of an electro-magnetic burglar, fire, and house alarm, invented and patented by Mr. William Whiting of Roxbury, Mass. It consists of a series of electro-magnetic circuits leading from the various parts of the building to be protected, through an indicator to an alarm apparatus, which is put in operation by breaking the connexion of any of the circuits, which is done by opening the doors, windows, or other means of access to the places guarded. A very ingenious arrangement is also provided for indicating the presence of fire by a sensitive metallic coil, which, by its expansion, will break the circuit. The special circuit broken is shown by the indicator; which with the alarm apparatus can be put up in any convenient place for observation. Mr. Pratt stated that the apparatus had been in practical operation for several months and had proved satisfactory.

Mr. A. N. Macpherson exhibited the model of a paddle-wheel for steamboats, invented by Mr. William Golding of Philadelphia. The model illustrated two very ingenious plans for feathering the paddles;

one by ratchets operating on a cog-wheel attached to the shaft; the other by an eccentric also placed on the shaft.

W. Jones submitted the register for warming and ventilating apartments, invented by Joseph Leeds. It consists of the usual openwork plate with a flat valve swinging on pivots set in a horizontal line. When the lower edge of the valve is brought forward against the openwork plate, the communication between the heat flue and the apartment is closed, while that between the apartment and the ventilating flue is opened. When the position of the valve is reversed, the heat is admitted and the ventilator closed. Should the apartment have the proper temperature, the valve is placed vertically, when the heat passes directly up the ventilating flue back of the valve. The Committee on Science and Art have had this register under consideration, and their report will no doubt appear in the pages of the *Journal.*

Mr. Agnew laid upon the table some scale detached from a boiler by the use of a chemical compound for cleaning boilers, &c., by Chester, Clark & Co., Practical Engineers, Allentown, Lehigh County, Pennsylvania, which appears to be useful in removing that troublesome complaint arising from the use of limestone water.

Mr. H. Howson presented some specimens of burnt cast iron recovered by the use of graphite, as applied by Messrs. Morris & Quain. No. 1 was made from old retorts melted with the graphite in the proportion of three of the former to one of the latter. Nos. 2 and 3 were specimens of wrought iron made from cast iron so melted. Extensive beds of this graphite are found in the neighboring counties of Chester and Lancaster.

BIBLIOGRAPHICAL NOTICE.

Engineering Precedents for Steam Machinery; Embracing the Performances of Steamships, Experiments with Propelling Instruments, Condensers, Boilers, &c., accompanied by Analyses of the same; the whole being original matter and arranged in the most practical and useful manner for Engineers. By B. F. ISHERWOOD, Chief Engineer, U. S. Navy; New York. H. Bailliere, 1859.

We have received the first volume of a series having the above title. It contains descriptions of the build, and accounts of the performances, with comparisons of a number of British Government steam vessels, constructed for littoral warfare by the best English makers; and the results of the trials with H. B. M. ship "*Conflict,*" propelled with screws of various kinds; as well as a comparison of the effect obtained during the test trials of the U. S. Steamers "*McLane*" and "*Spencer*" to determine the relative efficiency of the paddle-wheel and screw propeller. The present volume is a valuable contribution to the library of the marine engineer; and if (as hoped,) the author will continue his labors, and publish the data and results of his experiments and his observations in the other branches of engineering practice, they must prove acceptable to the profession at large. J.